

Founded in 1832

RAILWAY LOCOMOTIVES AND CARS

DECEMBER 1957

A SIMMONS-BOARDMAN TIME-SAVER PUBLICATION

formerly

RAILWAY
Mechanical and
Electrical Engineer

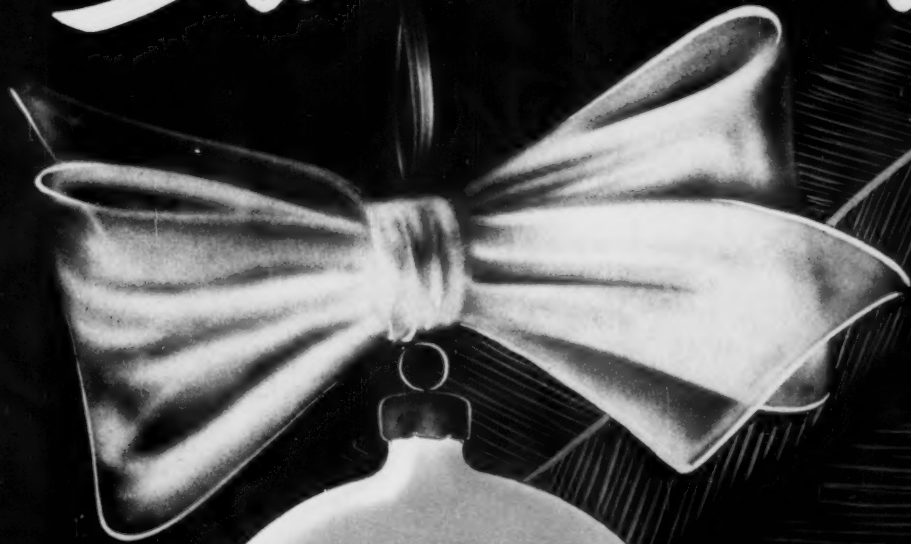
C&NW's One Big
Freight Car Shop

New Approach to
Low Grade Fuels

Glass Banding
of Armatures

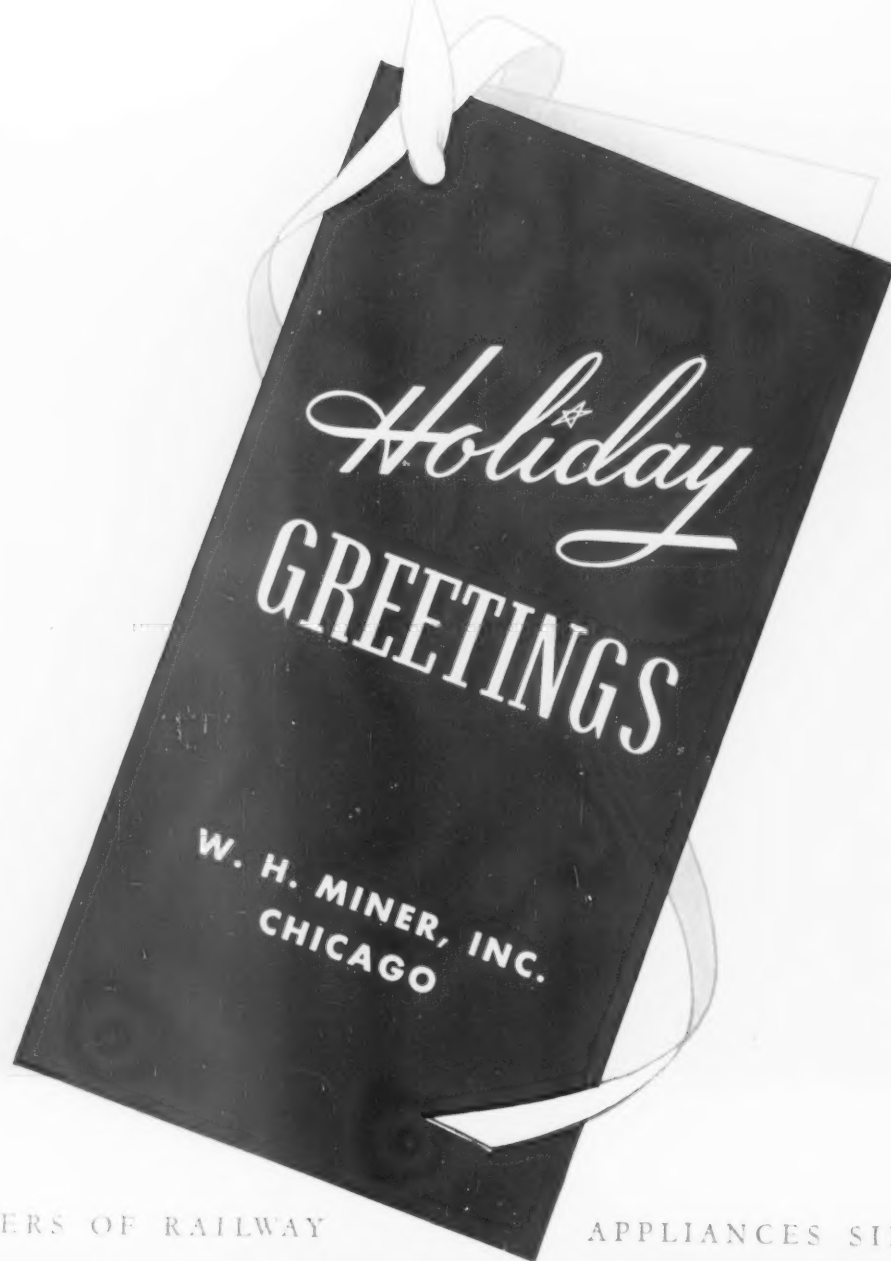
Roll Them Out
Like New

Season's Greetings..



WINE

THE WINE RAILWAY
APPLIANCE COMPANY
TOLEDO 9, OHIO



MANUFACTURERS OF RAILWAY

APPLIANCES SINCE 1894



20-year overhaul of Reading "Crusader" proves...



beauty of stainless steel is more than skin deep

In 1937 the Reading Railroad put the all-stainless steel "Crusader" in service on the New York to Philadelphia run.

This April, twenty years and almost two million miles later, they brought the "Crusader" in for its third complete overhaul. The condition of its stainless steel completely justified the confidence shared by the Reading and the Budd Company, the "Crusader's" builders, in nickel-containing stainless as a highly practical material for railroad car construction.

**Condition shows
it's inexpensive, too**

In the photos above, taken during

overhaul, you can see for yourself the excellent condition of the "Crusader's" stainless steel exterior skin and structural members.

No scale. No corroded parts to be replaced. Accumulated dust under the sheathing was easily removed by scraping. Sheathing itself was restored to original condition merely by wiping. With only this minor maintenance, the "Crusader's" stainless steel looks — and is — as good as new, as modern as tomorrow!

**There's more to stainless
steel than meets the eye**

In addition to such permanent resistance to corrosion, and lasting good

appearance, stainless steel has a high strength-to-weight ratio. Permits lighter cars, important savings in fuel costs. And builders find that its ductility and weldability permit fast, simple fabricating methods... economical production.

"Nickel Alloys in Railroad Equipment," a 32-PAGE BOOKLET, describes how nickel-containing stainless steels and other nickel alloys can lower operating and production costs and improve safety factors in rolling stock, locomotives and trackwork. For your copy, just write Inco.

The International Nickel Company, Inc.

67 Wall Street  New York 5, N. Y.

INCO NICKEL
NICKEL ALLOYS PERFORM BETTER LONGER

Bar-burned traction motors a problem?



Here's how your **NATIONAL** brush man helped one road slash reconditioning costs



MURPH VARNEY

At least 70 traction motors a year — laid up because of premature commutator bar burning. That was the problem "National" Carbon Brush Man Murph Varney found on a leading mid-west road. Amazingly, the road felt that resulting down time, parts and labor costs were the unavoidable price of high speed passenger operation.

Murph proved differently by analyzing this road's problem and recommending the right "National" car-

bon brush to alleviate bar burning. Result: premature removal of traction motors fell from 70 to 5 a year.

Murph Varney and his fellow "National" Carbon Brush Men have been solving railroad brush problems for years. Their experience and training — backed by "National" long term brush development — make them the logical consultants on any railroad brush application.

Call them today or write National Carbon Company, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y.



The terms "National", "N" and Shield Device, and "Union Carbide" are registered trade-marks of Union Carbide Corporation
NATIONAL CARBON COMPANY • Division of Union Carbide Corporation • 30 East 42nd Street, New York 17, N. Y.

Sales Offices: Atlanta, Chicago, Dallas, Kansas City, Los Angeles, New York, Pittsburgh, San Francisco. In Canada: Union Carbide Canada Limited, Toronto

RAILWAY LOCO- MOTIVES AND CARS

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in the United States

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TIME-SAVING IDEAS FOR

DECEMBER 1957

Volume 131 • No. 12

MOTIVE POWER AND CAR

C&NW Concentrates at Clinton 27

Big step in renovation of this hard-pressed railroad has been elimination of 14 separate car repair operations by construction of the new shop at Clinton, Iowa.

Monon Designs New Trailer Hitch 30

Piggy-back loading has been simplified with the new trailer hitch already installed on one-fourth of this railroad's "Trailer Maid" flat car fleet.

Pennsy Installs First Aluminum Box Car Doors 32

Lighter weight and corrosion resistance are but two of the advantages claimed for these Kaiser car doors which are already on Pennsy box cars.

Fumigation—Solution to Low-Grade Fuel Use? 33

New possibilities in the combustion of low-grade fuel oils on diesel locomotives were revealed last month to the Society of Automotive Engineers.

Transit Cars Outperform Previous Designs 34

Air-spring suspension and new high-capacity motors on Boston rapid transit cars increase passenger comfort and open up new scheduling possibilities.

Cleaning Road Locomotive Windshields 36

Streamlined noses of all builders' road diesels are not too easily reached from ground. Getting there and what to do then are this month's problems.

ELECTRICAL

Glass Tape for Armature Banding 38

The development of glass tape with parallel fibers in polymerizing resin may eliminate the need for steel banding wire.

Remember Number 5 39

If the engine insists on stopping in the No. 5 position, there are just three reasons for it.

How Does Environment Affect Brush Operation? 40

Factors which influence commutator film have much influence on commutation.

Roll Them Out Like New—Part 5 41

Electrical cleaning procedures from bucket and brush to vapor degreasers are compared in this chapter.

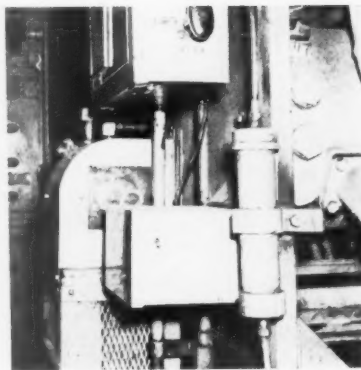
DEPARTMENTS

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Personal Mention	14	Helps from Manufacturers	66

LOCOMOTIVES AND CARS WHAT'S NEW IN EQUIPMENT



Saver showing clock control.



Saver mounted on locomotive.

Warm Engines with Less Fuel

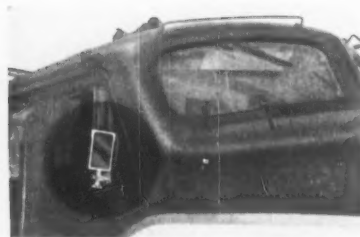
The La-Over Fuel Saver is a device for controlling diesel engine temperature during locomotive stand-by or layover periods. The diesel engine is automatically stopped and started in response to a precision time cycle and engine temperature control. The manufacturer states that fuel costs are reduced by eliminating long periods of engine idling and that cold idling is reduced to a minimum, decreasing engine wear.

The device functions to shut down the diesel engine for 40 min of each hour of layover. At the expiration of 40 min, the engine is automatically started. After 20 min of operation, the engine will

automatically shut down for another 40 min. This cycle continues until the locomotive is taken out for train service.

A thermostatic feature provides additional temperature control by automatically starting the engine, if the cooling water temperature falls below a predetermined value during the down portion of the cycle. The engine runs until temperature is restored. Then, control of the engine is returned to the "timer".

The equipment is in a metal box which measures 7 in. by 10 in. by 8 in. and weighs 15 lb. *Ajax-Consolidated Company, Dept. RLC, 4615 W. 20th st., Chicago 50.*



Rear-view Mirror

The Adjust-A-View mirror, model No. 06X, fits all classes of locomotives on both sides. According to the manufacturer, the engineman can adjust the mirror without the aid of a mechanic. Once locked into position, it is said not to vibrate because of wind or train movement, allowing a clear view of entire train.

An aluminum alloy frame is used with a 1/4-in. shatter-proof plate-glass mirror, protected by a plastic U-channel in frame. In case of breakage, mirror is replaced by removing the top of frame and two screws. The sealed-in, mirror surface has an area of 4 1/4-in. by 7 3/4-in., with 360 deg adjustment both ways.

The clevis, bracket, and handle are malleable iron, cadmium plated. *Transport Products Corporation, Dept. RLC, 3008 Magazine st., Louisville 11, Ky.*

Disposable Paper Wipers

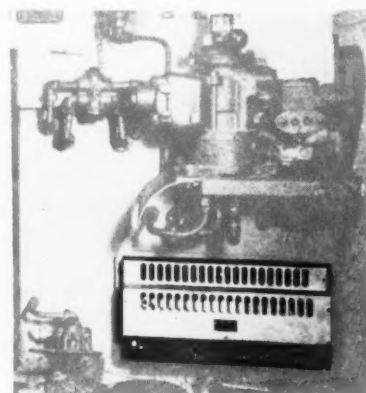
For greater safety and reduced maintenance wiping costs, disposable paper wipers have been adopted for diesel repair operations at the main shop of the St. Louis-San Francisco in Springfield,

Mo., and the Lindenwood shops in St. Louis. Cloths formerly used created a hazard, both from safety and performance standpoints, and were being used beyond their saturation points. In many instances more dirt was "wiped on" repaired parts than "wiped off." The wipers also frequently contained needles, pins, and other metal pieces that caused cuts and scratches when used for personal wiping.

In the mechanical department, paper wipers now help remove dirt from component parts, such as oil throwers and bearing caps of traction motor bearings; wheels that are regreased, etc. Perforated surfaces of Scott wipers provide hundreds of tiny pockets that soak up oil and penetrate greasy deposits. Solvents may also be used with the wipers to help loosen and remove oily films.

In the electrical department stripped down equipment, such as motor converters for steam generators, armatures, motor stators, etc., are cleaned with paper wipers. Throughout the shops paper wipers are also available from self-dispensing cartons for employee use.

The paper wipers cost a fraction of a cent apiece as compared with 18 cents a pound for the cloth wipers, plus laundry costs which have also been eliminated through the use of the disposable paper wipers. *Scott Paper Company, Dept. RLC, Chester, Pa.*



Heater for Locomotive Cabs

The Convectair electric heater provides heat in a locomotive without itself reaching a high temperature. Due to the design of the unit a large amount of air

(Continued on page 24)

**The world of science behind
EXIDE-IRONCLAD BATTERIES**



Being interviewed is W. W. Smith, Divisional Manager, Product Engineering. Grids in back are of Exide's exclusive Silvium. Those in front are ordinary alloys.

"All of these alloys had the same acid test"

*At the Exide Laboratories—***Reporter:** Was it a typical charge-discharge test normally used to test battery components?

Smith: Right. And the two positive plate grids with no visible signs of corrosion are Exide's patented Silvium alloy.

Reporter: How about the others—what alloys are they?

Smith: They're standard alloys used in other well-known makes of batteries. But they don't have Silvium's corrosion-resisting ingredients.

Reporter: Where is Silvium used?

Smith: In the positive plates of all Exide-Ironclad and many other Exide Batteries.

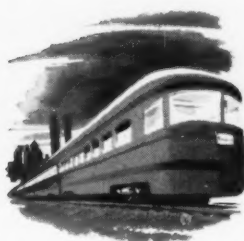
Reporter: How does it affect battery performance?

Smith: Every test we've made proves it stretches battery life because the grid resists corrosion—sometimes up to 100% longer.

Reporter: Obviously this is an important feature of the Exide-Ironclad.

Smith: Yes it is, but it's just one of many engineering details that contribute to its high capacity and long life.

Note to battery users: Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For detailed bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Philadelphia 2, Pa.

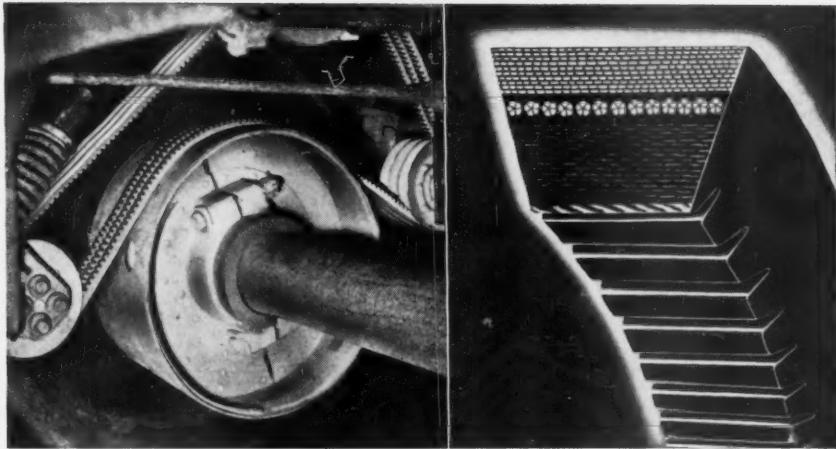


THE ELECTRIC STORAGE BATTERY COMPANY

Exide

L & N Railroad Uses Dayton Cog-Belt* Drives for





For low initial cost, easy installation, and least maintenance, specify dependable Dayton endless Cog-Belt Drives on your caboose installations.

87 Caboose Generators

Additional 49 drives being installed to complete modernization

Since 1954, the Louisville and Nashville Railroad has equipped a total of 87 of its cabooses with two-way radio telephones. The generator is driven, in each case, by a Dayton Cog-Belt* Axle Drive.

In the present phase of this extensive modernization program, 49 more L&N Cabooses are being radio equipped. And again, Dayton undercar drives are being used on each piece of equipment.

This is another example of Dayton's excellent record of trouble-free service on railroads everywhere, a factor important to every Railway Electrical Engineer who specifies undercar drives.

Trouble-free Dayton Cog-Belts are specially built . . . making them tough enough to stand up for years in any type of railroad service . . . air conditioning, diesel locomotives or caboose drives. Dayton Railway Endless Cog-Belts will, size for size, transmit more horsepower than any other V-Belt made.

The proof is in the experience of this railroad and the many other roads in every part of the nation that have been using Dayton V-Belts with marked success over the last 25 years. For technical assistance with any type of undercar drive, call your Dayton representative, or write The Dayton Rubber Co., Railway Division, Dayton 1, Ohio.

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*T.M.

Dayton Rubber

World's Largest Manufacturer of V-Belts

Specialized Railway Representatives in Atlanta, Chicago, Cleveland, Dallas, Dayton, Moline, New York, San Francisco and St. Louis

LOCOMOTIVES AND CARS REPORT FOR NOVEMBER

Orders and Inquiries for New Equipment

Placed Since the Closing of the November Issue

Diesel-Electric Locomotive Orders

Road and builder	No. of units	Horse-power	Service	Other detail
NORTHERN PACIFIC: Electro-Motive	15	1,200	Switchers	30 units for delivery first half 1958.
Alco Products	13	1,750	Road switchers	Road contemplates placing orders later this year for similar number of units for second half delivery.
NEW YORK, CHICAGO & ST. LOUIS: Electro-Motive	2	1,800	Road switchers	
Alco Products	20	1,750	Road switchers	40 units for delivery in February-March.
Fairbanks, Morse	10	1,800	Road switchers	
	10	1,200	Yard switchers	

Freight-Car Orders

Road and builder	No. of cars	Type of car	Capacities	Other detail
BANGOR & ARROTHOOK: Marot Car	150	Pulpwood	—	End rack, roller-bearing equipped. Approximate cost, \$1,580,000. Delivery early next summer.
CHICAGO & NORTH WESTERN: Pullman-Standard	275	Covered hopper	70	For January delivery.
	200	Gondola	70	Mill type. For March delivery.
LONG ISLAND: International Ry. Car	6	Cabooses	—	For March delivery. Total cost, \$82,050. Will have neither bay windows nor cupolas, but will have two walk-over passenger-type seats inside at windows.
MINNEAPOLIS & ST. LOUIS: Pullman-Standard	50	Covered hopper	—	For April delivery.
	2	Box	—	With Evans DF equipment. For January delivery.
NORFOLK & WESTERN: Company shops	1,500	Hopper	70	For late 1958 delivery.
UNION PACIFIC: Pullman-Standard	525	Box	50	—
WILSON CAR LINES: Pacific Car & Fdry.	200	Refrigerator	40	Unit cost, \$14,000. For delivery first quarter 1958.

Passenger-Car Orders

Road	No. of cars	Type of car	Other detail
CHICAGO & NORTH WESTERN: Pullman-Standard	10	Coaches	13 cars to be of "bi-level" design. Cost, \$2,500,000. Delivery scheduled for next summer.
	1	Parlor car	
	1	Coach-parlor	
	1	Coach-bar-lounge	

Inquiries and Notes

FREIGHT CARS:
Minneapolis & St. Louis—Will soon begin installation of Evans DF equipment at its Marshalltown, Iowa, shops.
Louisville & Nashville—Will install roller bearings on 230 passenger-train cars, including 120 baggage cars, 30 combination baggage-mail cars, and 30 coaches, at its South Louisville, Ky., shops at a unit cost of approximately \$3,000.

Train Performance Studies Made in Minutes

By means of digital computers, now owned by a number of railroads, locomotive tonnage ratings and the performance of a train of given consist over a section of railroad can be quickly predetermined. This includes grade, curvature, speed restrictions and other operating conditions. Tonnage rating calculations on the digital computer require from one to five minutes per locomotive group, depending on the length of track involved and the degree of accuracy desired.

The manner in which this may be done will be described in a paper by

J. E. Hogan, Pennsylvania Railroad, to be presented before the Land Transportation Committee at the Mid-Winter Meeting of the American Institute of Electrical Engineers, to be held in the Hotel Statler, New York, February 2-7, 1958.

No Atomic Locomotive

"There have been many discussions of the nuclear locomotive. I think such a machine is a most ingenious solution of the question how to combine minimum utility with maximum danger. Trains in the atomic age will no doubt be electric."

The foregoing is a quotation from an article "Atomic Energy in the Year

2,000," by Dr. Edward Teller, which appears in the Fall 1957 issue of *The Lamp*, published by the Standard Oil Company of New Jersey. Dr. Teller is a noted physicist and has sometimes been called the father of the hydrogen bomb.

Miscellaneous Publications


MECHANICAL RESEARCH REPORT MR-271—Survey Covering Various Types of Fuels Used in Diesel Locomotives, dated September 1956. Report based on information compiled from questionnaires sent to 33 selected representative railroads. *Fred Peronto, secretary, Mechanical Division, Association of American Railroads, 59 East Van Buren st., Chicago 5.* Price: Members 75 cents; others \$1.50.

MECHANICAL RESEARCH REPORT MR-290—Economic Analysis of Overheated Journals, dated July 1957. Covers analysis of 1,344 axles which had overheated journals and makes an evaluation of cost required if certain revised methods of handling were to be adopted. *Fred Peronto, secretary, Mechanical Division, Association of American Railroads, 59 East Van Buren st., Chicago 5.* Price: Members, \$1.50; others, \$3.

(Turn to page 14)

Summary of Monthly Hot Box Reports

Month	Cars set off between terminals with Hot Boxes		Miles per car set off
	System	Foreign	
August 1953	8,638	14,160	130,319
August 1954	7,568	9,742	155,756
1955			
August	8,555	14,358	128,941
September	5,896	10,469	178,649
October	3,966	7,182	271,364
November	2,010	3,972	493,184
December	1,819	3,774	522,444
1956			
January	2,029	4,302	462,029
February	2,570	5,611	341,542
March	2,517	6,212	346,853
April	3,202	6,881	290,626
May	4,672	10,903	196,688
June	6,777	15,125	135,774
July	8,484	16,067	113,573
August	9,891	16,892	113,474
September	6,834	12,629	149,970
October	4,357	8,429	243,505
November	2,650	5,560	359,759
December	2,256	4,436	438,425
1957			
January	3,373	6,121	291,453
February	3,272	6,844	264,538
March	3,164	6,687	307,306
April	3,949	8,447	228,493
May	6,580	12,691	154,387
June	8,285	16,277	115,749
July	10,438	18,819	96,064
August	9,662	17,639	109,839



Check list for a customer: to measure a supplier's dependability in the future

During the past six months we have discussed *responsibility* as the basis of selecting a supplier.

We covered *price* in relation to rising material costs. We discussed *delivery* and gave examples of "responsible delivery." We showed that delivery becomes *customer-service* through the same careful attention to orders for repair parts as was given to your original order.

We asked you to check daily performance to measure the quality of a supplier's *product*. And we showed how Research and Development helps a supplier to *set-the-pace* toward serving you best in the future with new products and product uses.

Now, we ask you to do one thing more. Study your suppliers with regard to all these areas. Use the performance of the past—and today—to measure the degree of a supplier's dependability in the future. Select a supplier who gives proof *every day* of being responsible in *all* these aspects. He is the supplier you can depend on in the future.

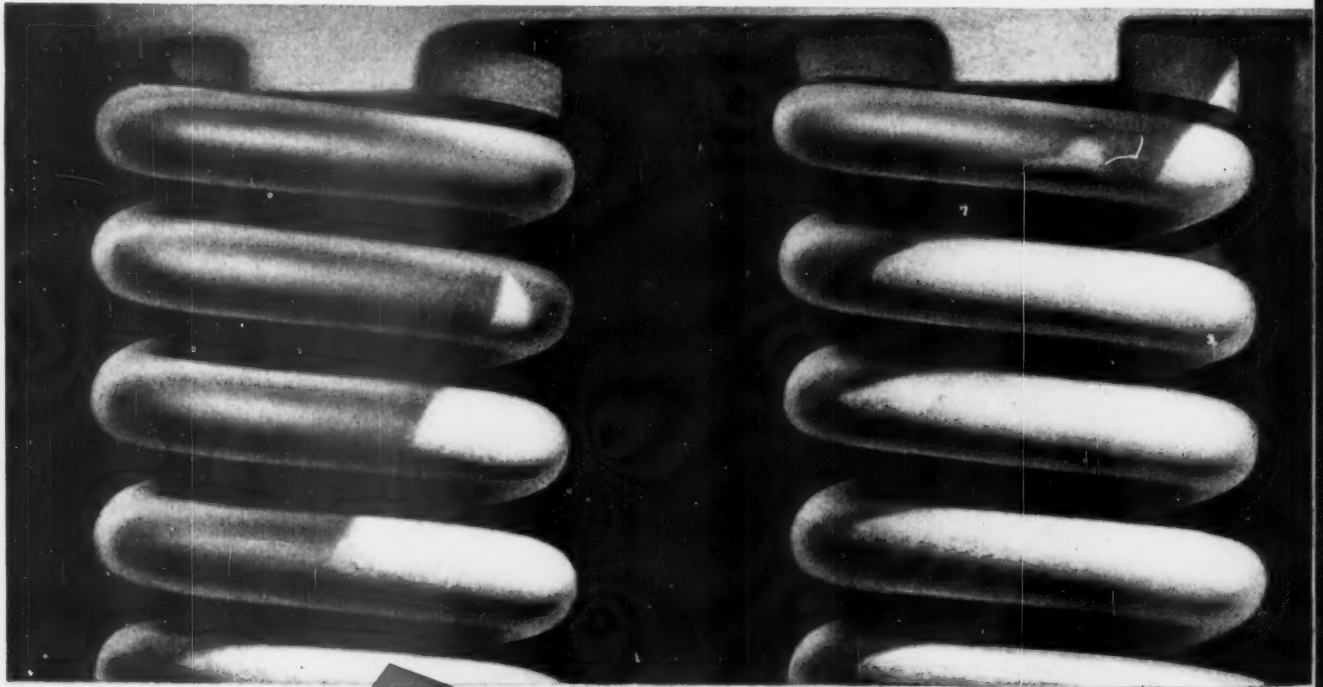
You will be interested in the series of advertisements that will appear in the following months. They will show, by specific product-examples, how a supplier's responsibility and dependability can serve you through greater performance and cost reduction.

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY

General Office: 4527 Columbia Ave., Hammond, Ind. • New York • Chicago • St. Paul • San Francisco



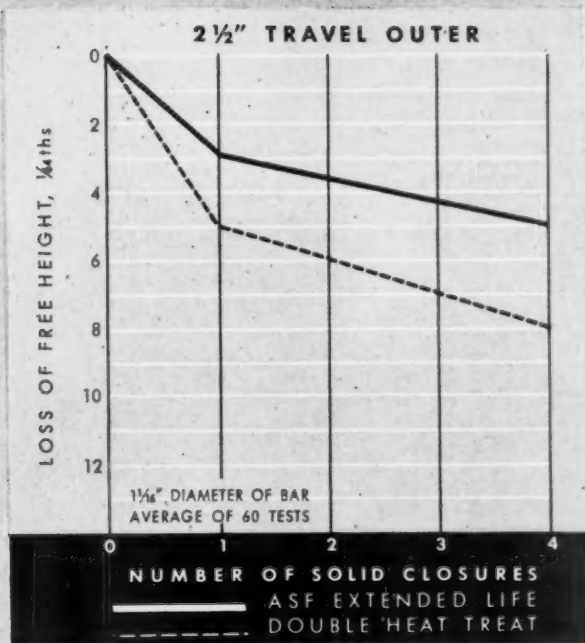
The spring that provides
a soft ride.



A S F



...longer!



Here is one of the really significant advantages of ASF Extended Life Springs. As shown by the graph, these springs have almost twice the resistance to permanent set—compared with conventionally heat-treated springs.

In many ways this is a more important advantage of Extended Life Springs than greater resistance to breakage. Any car man can quickly detect a broken spring . . . but the *unseen* cause of many a hard-riding car is the spring that is shirking its share of the load.

ASF Extended Life Springs are available at no increase in price. How much will they save on your road? It depends on your own operating conditions . . . but specifying these modern springs will give you an automatically higher return on your spring investment.

E-X-T-E-N-D-E-D L-I-F-E SPRINGS

A contribution to railroad progress through research by

AMERICAN STEEL FOUNDRIES

Prudential Plaza, Chicago 1, Illinois

Domestic Sales: International Sales: 200-250-0000 and 200-250-0001

Report

(Continued from page 10)

New Books

NEW LESSONS IN ARC WELDING. Second Edition. Completely rewritten and reorganized for easier reading and use as a text or reference. Includes information on new procedures, machines and electrodes. Book divided into seven separate sections with each section comprising several lessons. Sections deal with specific instructions on arc welding techniques and related welding information necessary to the development of the techniques; the proper use of welding machines and electrodes, and reference material on metals, procedures, testing and weld symbols. *Lincoln Electric Company, Cleveland 17.* Price, \$1 in U.S.A.; \$1.50 elsewhere.

COPPER AND COPPER-ALLOY WELDING RODS. Second edition. Tentative specifications cover copper and copper-alloy welding rods (AWS A5.10; ASTM B259) for use with oxyacetylene, carbon-arc and gas tungsten-arc welding processes. Chemical composition, mechanical properties and usability characteristics of each of eleven classifications given, together with tests for verifying properties. Appendix provides information on the use of each filler metal for joining difference base metals with the different welding processes. *American Welding Society 33 West 39th st., New York 18, or American Society for Testing Materials, 1916 Race st., Philadelphia 2.* Price, 40 cents.

SYMPOSIUM ON VAPOR PHASE OXIDATION OF GASOLINE.—68 pages. Presents five papers discussing significant facets of the problems of vapor phase oxidation of gasoline. The symposium was originally presented at the Second Pacific Area National Meeting in Los Angeles, Calif., under sponsorship of ASTM Committee D-2 on Petroleum. *American Society for Testing Materials, 1916 Race st., Philadelphia 3.* Price, \$2.50.

Personal Mention

Atchison, Topeka & Santa Fe.—PETER I. ISAACSON, engineer shop extensions, Topeka, Kan. retired.

Canadian National.—RICHARD M. VEENIS, superintendent of motive power and car equipment, North Bay, Ont., appointed superintendent of motive power and car equipment, Montreal, Que.

Canadian Pacific.—J. FOWLER, general locomotive foreman, Winnipeg, Man., appointed division master mechanic, Portage division. Headquarters, Winnipeg.

Chesapeake & Ohio.—HORACE M. VISE, JR., appointed assistant superintendent

Selected Motive Power and Car Statistics

• Freight Service (Data from I.C.C. M-211 and M-240)

No.	Item	Month of August		8 months ended with August	
		1957	1957	1957	1957
3	Road locomotive miles (000) (M-211):				
3-06	Total, Diesel-electric	38,232	37,184	294,940	296,641
3-07	Total, electric	746	741	5,557	5,835
3-04	Total, locomotive-miles	41,407	42,299	319,544	335,794
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	753	745	12,931	13,398
4-06	Empty, total	1,002	937	7,658	7,507
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-03	Total in Diesel-electric locomotive trains	114,869	108,355	869,782	852,086
6-04	Total in electric locomotive trains	2,389	2,405	17,592	18,006
6-06	Total in all freight trains	125,956	123,629	948,273	963,967
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principal and helper)	1.03	1.03	1.02	1.03
10-02	Loaded freight car-miles	44.2	43.6	43.2	42.8
10-03	Empty freight car-miles	25.9	23.8	25.6	24.0
10-04	Total freight car-miles (excluding caboose)	70.1	67.4	68.8	66.8
10-05	Gross ton-miles (excluding locomotive and tender)	3,255	3,138	3,169	3,081
10-06	Net ton-miles	1,499	1,455	1,442	1,407
12	Net ton-miles per loaded car-mile (M-211)	33.9	33.3	33.4	32.8
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	63.1	64.7	62.8	64.1
14	Averages per train hour (M-211):				
14-01	Train miles	18.5	18.2	18.8	18.6
14-02	Gross ton-miles (excluding locomotive and tender)	59,555	56,558	58,906	56,709
14	Miles per Diesel-electric unit day (M-240):				
14-01	Road freight units	210.6	—	209.7	—
14-02	Road passenger units	444.5	—	442.9	—
18	Average net ton-miles per freight car-day (M-240)	970	965	925	942
19	Per cent of home cars of total freight cars on the line (M-240)	111.1	112.5	110.8	112.0
17	Car-miles per freight-car day (M-240):				
17-01	Serviceable freight cars	47.6	46.7	46.0	46.6
17-02	All freight cars	45.4	44.7	44.1	44.8

• Passenger Service (Data from I.C.C. M-213)

3	Road motive-power miles (000):				
3-06	Diesel-electric	19,976	20,775	156,760	163,256
3-07	Electric	1,113	1,237	9,303	10,080
3-04	Total	21,393	22,716	168,576	179,556
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	225,096	239,837	1,732,681	1,858,004
4-11	Total in Diesel-electric locomotive trains	209,427	219,377	1,601,510	1,687,032
12	Total car-miles per train-mile	9.96	10.09	9.77	9.91

• Yard Service (Data from I.C.C. M-215)

1	Freight yard switching locomotive-hours:				
1-03	Diesel-electric	3,883,095	3,804,517	30,337,699	30,275,444
1-06	Total	4,038,034	4,058,590	31,642,648	32,422,021
2	Passenger yard switching hours:				
2-03	Diesel-electric	240,819	248,803	1,910,924	1,982,672
2-06	Total	268,301	282,287	2,156,253	2,256,385
3	Hours per yard locomotive-day (averages):				
3-02	Diesel-electric	15.4	15.5	15.4	15.7
3-05	Serviceable	15.6	15.7	15.6	15.7
3-06	All locomotives (serviceable, unserviceable and stored)	14.4	14.3	14.3	14.2
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.64	1.65	1.69	1.68
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.73	0.73	0.77	0.75

¹ Excludes B and trailing A units.

car department at Grand Rapids, Mich., as announced in October issue, began railroad career as a car inspector at Clifton Forge, Va., in December 1941. Subsequently became tool car foreman; foreman car department, Newport News, Va.; general car inspector, Huntington, W. Va., and Ashland, Ky., general foreman car department, Huntington; and assistant to general superintendent car department, Richmond, Va.

Grand Trunk Western.—H. W. ASKEW, assistant general superintendent motive power and car equipment, Battle Creek, Mich. appointed general superintendent motive power and car equipment, suc-

ceeding A. SELBEE, retired. K. E. HUNT, assistant superintendent, economics branch, research and development department, Canadian National, Montreal, succeeds Mr. Askew.

New York Central.—New York: H. LIEBERT appointed senior industrial engineer, succeeding CHARLES A. PEASE, retired. *Collinwood, Ohio:* D. H. MALLOCH appointed manager, material inspection. R. G. SAUERMAN appointed petroleum research engineer. *Cleveland:* A. T. GREEN appointed supervisor diesel records, succeeding Mr. Sauerman.

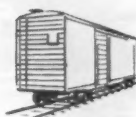
Norfolk & Western.—W. D. EMMONS, (Continued on page 16)

SAVINGS FACTS:



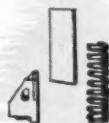
FACT No. 1

Barber Stabilized Trucks save maintenance costs. When it's necessary to service Barber parts, the friction castings and side springs are removed and replaced *5 to 10 times faster* than those of any competitive truck.



FACT No. 2

Barber Stabilized Trucks protect your equipment. Their unique system of suspension absorbs and eases . . . by friction . . . the destructive vertical shocks and bouncing as well as the lateral forces which usually result in dangerous nosing and swivelling.



FACT No. 3

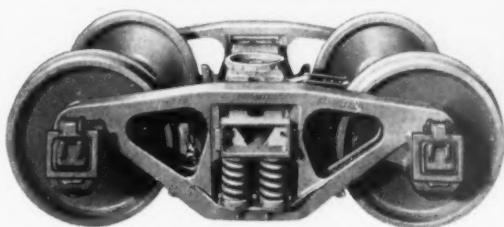
Simplicity and durability in action! Barber's three sturdy parts . . . the special *friction shoe*, the *wear plate* and the *side spring* . . . can be inspected at a quick glance. Fewest possible working parts require less attention, do a better job.



FACT No. 4

Barber Stabilized Trucks save on damage claims. They provide *the smoother ride* for loadings. Simply stated, Barber Stabilized Trucks provide variable friction for variable loads. No over-solid spring blows! For smoother-riding freight cars, insist on Barber.

Specify Smoother-Riding



BARBER

Stabilized Trucks

Standard Car Truck Company
332 S. Michigan Ave., Chicago 4, Illinois

In Canada
Consolidated Equipment Co., Ltd., Montreal 2

FRAHM® and JAGABI® Speed Measuring Instruments



... to meet every requirement
Write for Bulletin 35-X

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Electrical & Scientific Instruments

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BE SURE YOU'RE ON THE RIGHT TRACK
ALWAYS SPECIFY



MEGGER® Electrical Resistance Measuring Instruments

... for all electric, Diesel-electric locomotives and other
electrical equipment testing requirements.

Write for File RR #1



Personal Mention

(Continued from page 14)

night roundhouse foreman at Bristol, Va., appointed general foreman, succeeding J. H. HAHN, retired.

Southern.—*Birmingham, Ala.:* MERLE T. COOK appointed road foreman of engines. *Danville, Ky.:* MARVIN W. WEST appointed road foreman of engines. Foremen appointments — ROBERT J. SMITH and JAMES L. GREGORY. *Atlanta, Ga.:* Assistant foremen: ROLAN E. IVIE, ROBERT W. ELIUM, HARRELL G. VALLEY, JR. *Spartanburg, S. C.:* WILLIAM T. HESTER appointed assistant foreman. *Asheville, N. C.:* WILLIAM E. HEDGE-PARTH appointed relief foreman (car department).

Obituary

LOREN S. WELLS, former electrical superintendent, Pennsylvania, died October 5 after a long illness.

JOHN S. COOLIDGE, chief engineer of the Cos Cob power plant of the New York, New Haven & Hartford, died October 4.

Supply Trade Notes

SAFETY INDUSTRIES.—Roy A. Slettevold has joined Safety as sales representative at St. Louis. He was previously a sales engineer for Thomas A. Edison Storage Battery Division in Chicago.

KAISER ALUMINUM & CHEMICAL CORP.—Clarence W. Higbee has been appointed assistant general manager and Gillette N. Houck sales manager of the newly established Electrical Conductor Division, regional sales managers for the division are: J. W. Loveland, northeastern region, New York; W. J. Lawrence, southeastern region, Philadelphia; H. B. Stauffer, Great Lakes region, Cleveland; J. G. Johnson, north central region, Chicago; E. K. Matteson, south central region, Kansas City; and L. M. Guibara, western region, Los Angeles.

SHELL OIL COMPANY.—A regional railway sales office has been opened in Chicago, enlarging the territory formerly handled out of the St. Louis office. L. L. Butcher, formerly regional manager of the railway sales office there, is regional manager in charge of the new office. He is assisted by J. C. Kleber and Edgar R. Shutz, formerly of St. Louis.

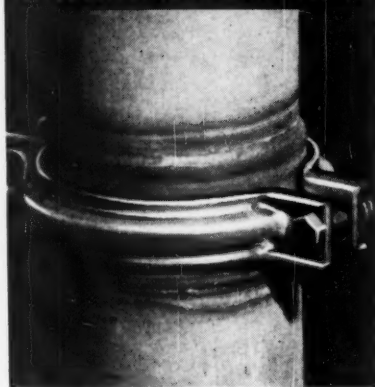
A. M. BYERS COMPANY.—A. S. Chalfant has been appointed director of steel sales at Pittsburgh.

(Continued on page 18)

MARMAN

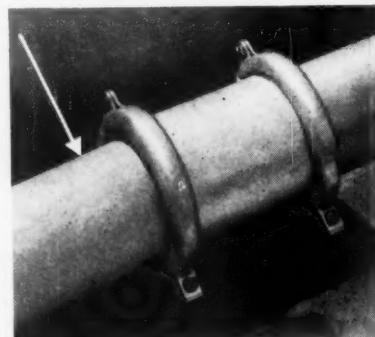
Joints and Couplings Speed Connection

OF LOCOMOTIVE PIPE AND TUBING



SERVICEMASTER V-BAND TUBE JOINT

for diesel engine exhaust systems features quick installation and disassembly for servicing. Bolted flanges are eliminated. Available in corrosion-resistant and mild steel for tube sizes from 1½" to 4½".



FLEXMASTER PIPE COUPLING

for diesel hot water and lube oil systems features quick assembly, with no pipe cutting or threading. It absorbs vibration, allows minor misalignment. In sizes for 2½" and 3" pipe.

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Tube Joint

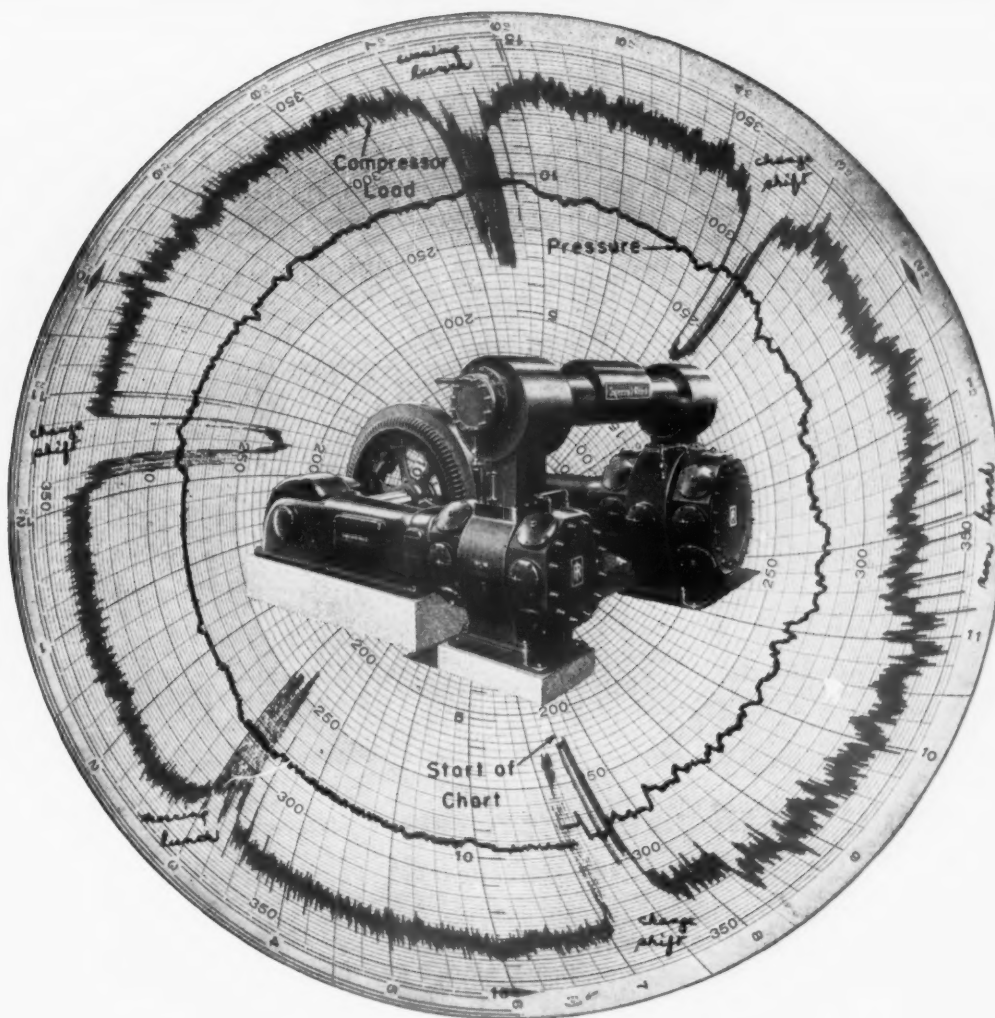
☐ Flexmaster
Pipe Coupling

Name _____

Title _____

Company _____

City _____ Zone _____ State _____



AROUND THE CLOCK *with an Ingersoll-Rand PRE Compressor*

Heavy 24-hour loading like this is all in a day's work at Caterpillar Tractor Co.

An air compressor doesn't punch a time clock. But the 24-hour pressure-capacity chart shown above gives an even better record of its actual, on-the-job performance at Caterpillar Tractor Co., Peoria, Ill.

This chart was taken on a nine-year-old PRE compressor supplying 3330 cfm at 95 psi for general plant air. Except for a slight "breather" during changing of shifts, this heavy-duty compressor is called upon to deliver full rated capacity virtually 24 hours a day — month after month, year after year.

This compressor is one of eight PREs (total capacity 24,640 cfm) in round-the-clock service

at the Caterpillar plant. The first PRE unit was installed here in 1927 and, like all the rest, is still giving efficient, dependable performance under full load conditions.

For proved dependability like this, in continuous heavy-duty service, it pays to specify Ingersoll-Rand compressors. Ask your I-R representative to give you the complete story.



PRE compressors, 400 to 3000 hp, use I-R Channel Valves

Ingersoll-Rand
1-567
11 Broadway, New York 4, N. Y.

COMPRESSORS • GAS AND DIESEL ENGINES • ROCK DRILLS • PUMPS • TURBO-BLOWERS • AIR AND ELECTRIC TOOLS

RUGGED! POWERFUL!

built for tough
Railroad Service!



START
your Diesels
FAST!



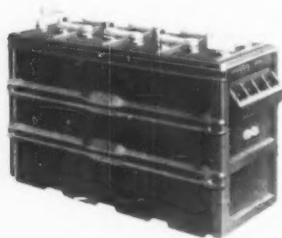
NEW BULLETIN gives latest tips on C&D Diesel Starting Batteries

**Tells how to reduce locomotive maintenance
... how to 'start your Diesels fast'**

Motive power men and purchasing agents will find page after page of useful money-saving information in this comprehensive new bulletin on "Diesel Locomotive Batteries." Expressly prepared to help railroad men specify the right type batteries for dependable Diesel cranking service, this illustrated guide gives the complete "inside story" on

the construction and operation of powerful C & D *Slyver-Clad*® batteries. Conventional lead-antimony types ... special low types ... as well as the latest lead-calcium extra-long-life types are covered. Detailed charts show you how to specify the exact type battery you need for reliable low-maintenance operation.

Write for a copy. You'll find it an important addition to your technical library.



Batteries built to give quick, sure starts ...

With extra-thick, extra-long plates ... and exclusive *Slyver-Clad* construction ... C&D Diesel Starting Batteries provide power-plus. "Better Built Batteries" also assure:

- high sustained voltage during cranking
- reduced connector loss
- reduced maintenance requirements
- long, dependable operating life

WRITE FOR BULLETIN DL-577

C&D BATTERIES, INC.

of Conshohocken, Pa.

SINCE 1906

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

Supply Trade Notes

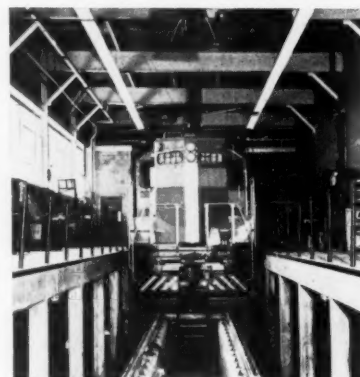
(Continued from page 16)

GENERAL ELECTRIC COMPANY.—The Locomotive and Car Equipment Department at Erie, Pa., has been reorganized into three independent product sections. *Frank A. Compton, Jr.*, has been appointed manager of the Locomotive Section; *Forman H. Craton*, manager of the Equipment Section, and *Joseph U. Neill*, manager of the Repair and Renewal Parts Sales Section. Mr. Compton was previously manager of engineering for the department; Mr. Craton, manager of marketing, and Mr. Neill, manager of the parts and repair sales subsection.

EVANS PRODUCTS COMPANY.—*R. K. Tobin* has been transferred from Plymouth, Mich., to Chicago where he will be district sales manager, Railroad Loading Division.

DEARBORN CHEMICAL COMPANY, LTD.—*Thomas F. Klein*, vice-president, Railroad Division, will retire January 1. *William H. Spencer* will assume Mr. Klein's duties as special representative, Railroad Division, with headquarters in Montreal.

JOY MANUFACTURING COMPANY.—*William L. Wearly* has been elected president, succeeding *John Lawrence*, resigned.

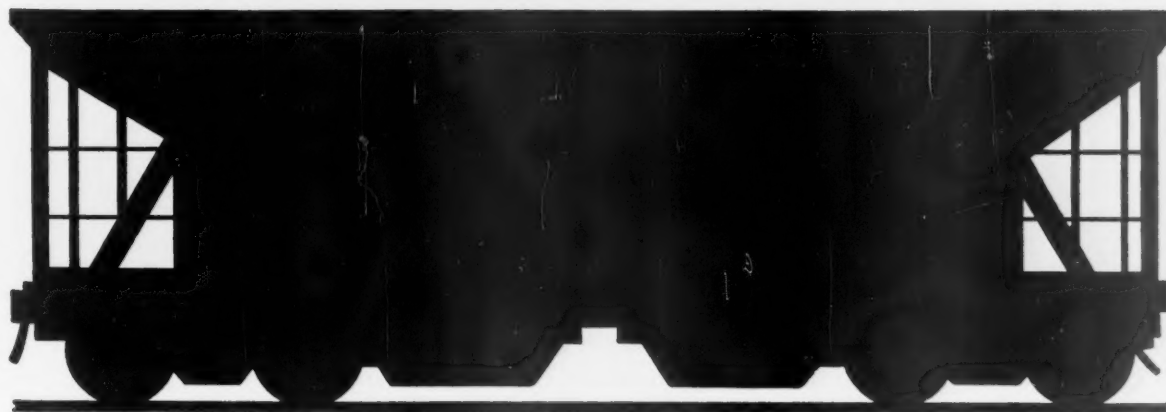


East Bay of new GM test building at London, Ont., has three work levels.

GENERAL MOTORS DIESEL LIMITED.—A new building for the testing of locomotives and mobile power cars has been placed in service in London, Ont. It is 120 ft long and 50 ft wide and houses four road locomotives. Three work levels in the East Bay of the building permits inspection of all parts of a locomotive. The unheated West Bay, separated by a concrete wall for noise suppression, is intended to house units under standing load and consuming great quantities of outside air. Banks of resistor grids permit simultaneous testing of two locomotives or one locomotive and one stationary unit or a power car.

(Continued on page 22)

Get these advantages of Armco High Strength Steels for freight cars



Armco's two grades of high strength, low alloy steel offer these important advantages for freight car construction:

ARMCO HIGH STRENGTH No. 1 meets the requirements of A.S.T.M. Specification A-242-55. It provides 4 to 6 times the atmospheric corrosion resistance of ordinary carbon steel used in car parts. And it's extra strong, with yield strength of 50,000 psi min.; ultimate tensile strength, 70,000 psi min. It is easily welded by standard methods.

ARMCO HIGH STRENGTH No. 2 provides the same high degree of atmospheric corrosion resistance and weldability as No. 1, plus typical yield strength of 45,000 psi and typical ultimate tensile strength of 64,000 psi. But in addition, it is specially processed to form well in bending, flanging, and moderate stamping.

SAVE MONEY

Used in place of ordinary carbon steel body sheets, either No. 1 or No. 2 will supply much longer service life—save money by lengthening time between repairs.

For more information about these long-lasting Armco High Strength Steels for freight cars, just fill in and mail the coupon, or call the Armco Sales office near you today.

ARMCO STEEL CORPORATION

2377 Curtis Street, Middletown, Ohio

Send more data about Armco High Strength Steels

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Company _____

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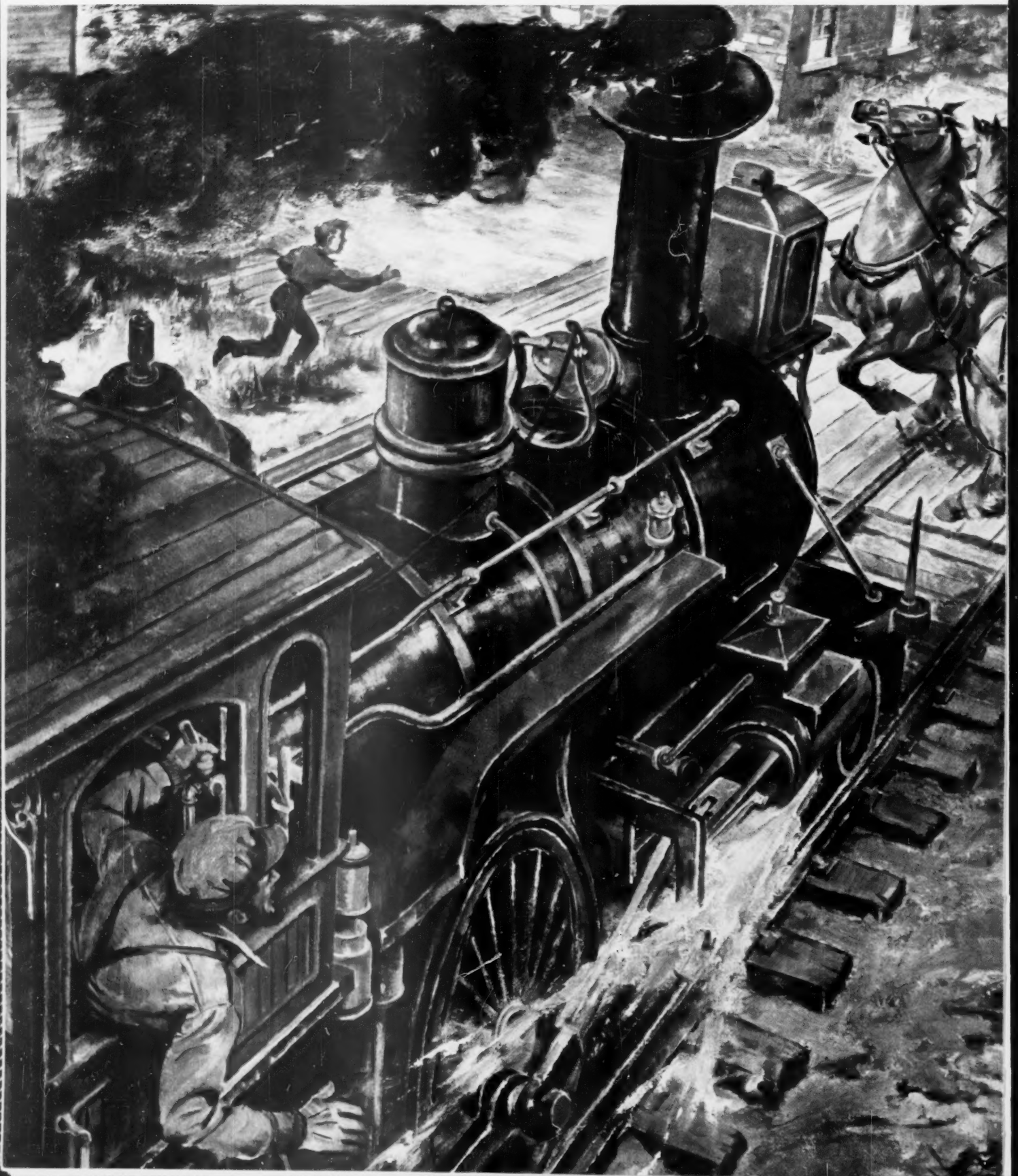
ARMCO STEEL CORPORATION

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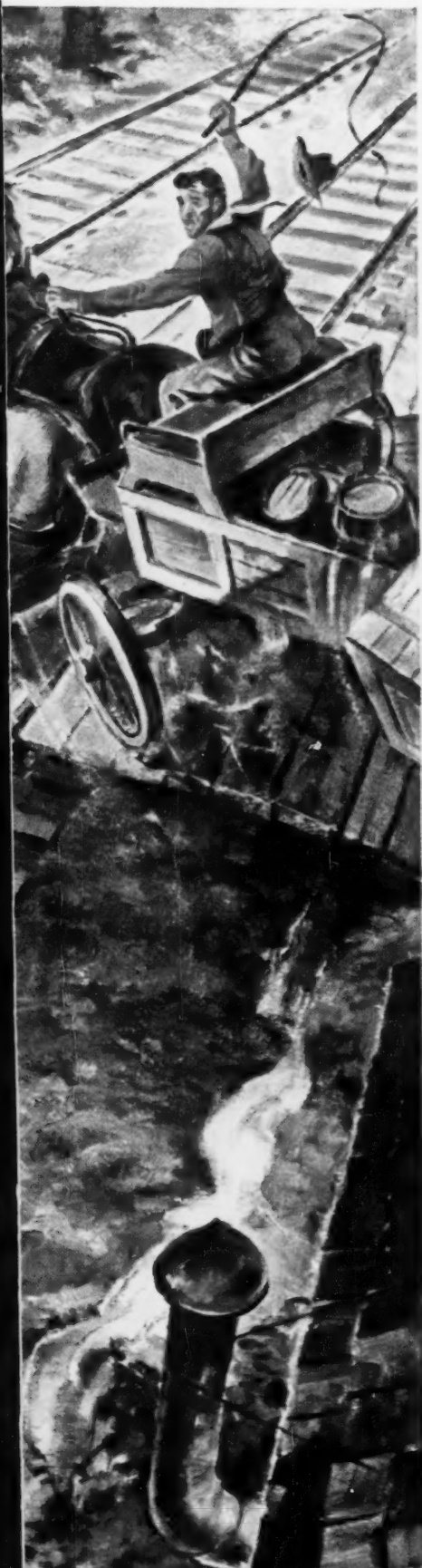
SHEFFIELD DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION



"He'll never stop



that train in time!"



The dramatic incident that started
George Westinghouse, inventor of the air brake,
on the road to
the Hall of Fame for Great Americans.

THE PAINTING shows a famous event in railroad history. Twenty-four-year-old George Westinghouse was demonstrating a new brake for trains. He said he could do the job with compressed air, instead of a long chain that stretched between cars. At that time, very few people thought an "air brake" would work.

The test train clanked out of Grant's Hill Tunnel in Pittsburgh—but there, right on the tracks, was a team of horses and a wagon. The engineman yanked the strange new brake lever for a full emergency stop. The brakes clapped shut on the wheels, and the train slid to a stop only four feet from the terrified, bucking horses. Never before had a train stopped so quickly. The dramatic story was told all over the land, and young George had won his first round toward total acceptance of the Westinghouse Air Brake.

On December 1, 1957, a bronze bust of George Westinghouse was unveiled and permanently enshrined in the Hall of Fame for Great Americans. The choice was made by a select committee of 125 distinguished Americans representing every state in the Union. Only 86 Americans have been so honored . . . among them such men as George Washington, Abraham Lincoln, Benjamin Franklin, Samuel Morse, Eli Whitney, Robert Fulton and Alexander Graham Bell.

The first company formed by George Westinghouse was the Westinghouse Air Brake Company. Following the policies he established, the Westinghouse Air Brake Company has carried on for more than 88 years a continuous program of research and development which has made it, today, the largest manufacturer of railroad air brake equipment in the world.

Westinghouse Air Brake COMPANY

AIR BRAKE DIVISION  WILMERDING, PENNA.

Supply Trade Notes

(Continued from page 18)

AMERICAN STEEL FOUNDRIES.—*C. E. Grigby*, vice-president in charge of sales, Transportation Equipment Division, Chicago, has been named vice president and general manager, and is succeeded by *William C. Taylor*, vice-president, New York sales office. Mr. Taylor's successor is *John C. Day*, district sales manager, New York, who becomes assistant vice-president. *Carl E. Tack*, chief mechanical engineer, promoted to vice-president and chief mechanical engineer.

OAKITE PRODUCTS, INC.—*Vern M. Coulson*, representative in Evansville, Ind., has been transferred to Ft. Worth, Tex., and *Thomas A. Reilly, Jr.*, has been assigned to Trenton, N. J. Both are technical service representatives.

THOR POWER TOOL COMPANY.—*A. V. Moroz*, electric tool salesman, has been appointed electric tool sales manager, Chicago branch.

UNITED STATES STEEL CORPORATION, AMERICAN STEEL & WIRE DIVISION.—*Maxwell D. Millard*, general manager of sales, has been named assistant vice-president-sales. His successor

is *Howard B. Maguire*, central area manager of sales, who in turn has been succeeded by *Norman M. Sted*, assistant general manager of sales. All have headquarters in Cleveland.

SPARTON CORPORATION.—*W. Bradley Gilkey* has been appointed western sales manager and special representative, Tri-Belt Division. Mr. Gilkey was formerly sales engineer, Evans Products Company. *Ralph L. Hitz* has been appointed sales and service engineer, Tri-Belt division.

CRUCIBLE STEEL COMPANY OF AMERICA.—*Lester C. Hill*, metallurgical engineer, has been appointed assistant sales manager of the Pittsburgh, Pa., Crucible Sales Division.

ARCHER-DANIELS-MIDLAND COMPANY.—*Bruce C. Gunnell* of Gunnell Engineering & Equipment Co., Alexandria, Va., will represent Freight Liner to railroads in the southeast, and *W. D. Jenkins*, Dallas, Tex., will be Freight Liner representative to railroads in Texas and the south central region.

C & D BATTERIES, INC.—*Edward H. Gossling, Jr.*, of *Charles F. Gross Associates*, C & D's Philadelphia sale office, has been appointed a C & D salesman in the Baltimore territory. *Donald G. Thrig* of *Agair Equipment Company*, C & D's Chicago sales representative, has been appointed a C & D salesman in the Chicago territory.

WAUKESHA MOTOR COMPANY.—*J. Grant Swain* has been appointed vice-president of sales, and *Newton H. Willis*, vice-president of engineering.

FAIRBANKS, MORSE & CO.—*James G. Graham*, general manager, Railroad Division, Chicago, has been appointed manager of the Los Angeles sales and service branch, succeeding *Paul A. Suess*, who retires January 1.

Obituary


ARTHUR A. LOGMANN, 64, manager of works, Pullman-Standard Car Manufacturing Company, died October 7 in St. Anthony's Hospital, Michigan City, Ind.

DR. PAUL DYER MERICA, who retired as president of the International Nickel Company of Canada in April 1954, died on October 20 in Tarrytown, N. Y.

WILLIAM J. PALLOWICK, 65, railroad representative for the Chicago Pneumatic Tool Company, died in Chicago September 22.

EDWARD J. BYRNES, JR., assistant general manager of sales, Eastern Division of the Colorado Fuel & Iron Corp., died October 8 at Palmer, Mass.

INTRODUCING THE



300

SERIES

GREAT NEW AC-DC ADDITION TO THE MILLER LINE



Here is the finest in inert gas and metallic welding
Complete particulars sent on request

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ELECTRIC MANUFACTURING CO., INC.

APPLETON, WISCONSIN

distributed in Canada by CANADIAN LIQUID AIR COMPANY, Ltd., Montreal

The Engineer's Field Report

CASE HISTORY

Chevron Starting Fluid
PRODUCT

Great Northern Railway
FIRM *Haure, Montana*

Special fluid starts 250-ton crane instantly, saves time in emergencies—even at 50° below



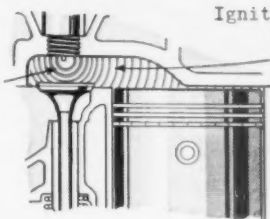
GREAT NORTHERN RAILWAY'S 250-TON, RAILROAD CRANE (above) starts instantly with Chevron Starting Fluid in temperatures ranging to 50° below zero—even after standing idle for months at a time. Former steam-powered wrecker equipment took crew 12 hours to start. This crane with its two 174 h.p. Cummins diesel engines is now available for derailment emergencies on short notice.

"Slow-grind starts on battery power alone waste too much valuable time. Chevron Starting Fluid fires

these engines 'right now'—in any weather." A Great Northern engineer shows how simple it is to insert 7CC gelatin capsule of Chevron Starting Fluid in unit's air-intake system. Fluid is also available in 17CC capsules and 1-pint cans.

Why Chevron Starting Fluid starts engines instantly

Highly
volatile:
7 times
more than
gasoline



Ignition temperature
several hundred
degrees lower
than diesel
fuel

Contains wear-
reducing lubricants

Additives inhibit
ice formation



FREE FOLDER! Tell more about the Chevron Starting Fluid and Chevron Pressure Primer System. Write or ask for them.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies listed below.

TRADEMARK "CHEVRON" AND DESIGN REG. U. S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey

STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA COMPANY, Denver 1, Colorado

What's New

(Continued from page 6)

is circulated without the need of a fan. More or less radiant heat is projected to warm the floor, depending on the number of heating elements energized.

On most locomotives, there is sufficient auxiliary generator capacity to supply two 1.6-kw heaters. A Convect-air heater, mounted on the front or side wall of a cab, projects a satisfactory amount of warm air toward one within three feet of the unit. *Ogontz Controls Company, Dept. RLC, 8029 York Road, Elkins Park, Philadelphia 17.*



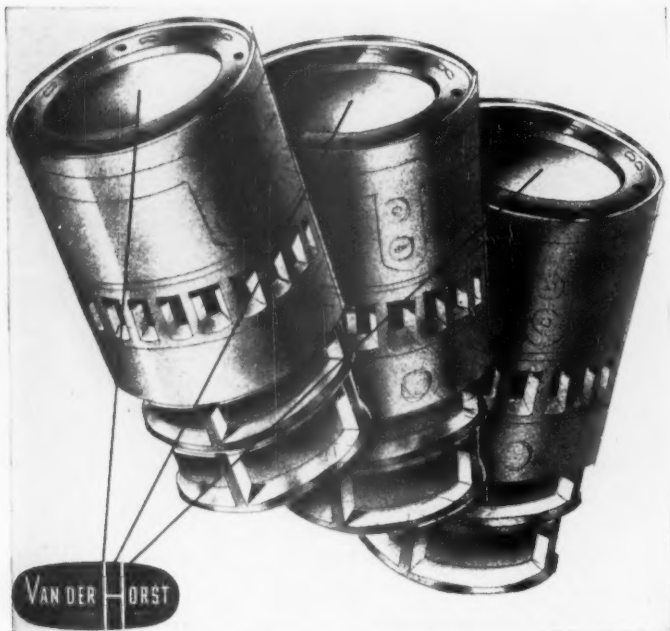
Welding Blowpipe

The Oxweld W-47 blowpipe can weld any metal thickness from 28 gage to 3-in. and handle heating jobs requiring

total gas flow up to 1500 cu. ft. per hour. Change of welding heads convert blowpipe from light-duty welding and brazing to heavy-duty welding or heating. A cutting attachment equips blowpipe for flame cutting metal up to 8-in. thick.

The W-47 is equipped with a new spring-type coupling nut, "O" ring gas seals and self-seating valves. Internal parts and handle are stainless steel and welding heads are chrome plated. *Linde Company, Div. of Union Carbide Corp., Dept. RA, 30 East 42nd st., New York 17.*

5 big advantages of



PORUS - KROME

Good for the Life of your Engines

- INCREASES CYLINDER LIFE 3 TO 5 TIMES.
- INCREASES PISTON RING LIFE UP TO 50%.
- ELIMINATES STOCKING OF OVERSIZED PISTONS AND PISTON RINGS.
- DEFINITELY CONTRIBUTES TO REDUCED DOWNTIME FOR ENGINES.
- DEFINITELY CONTRIBUTES TO A REDUCTION IN LUBE OIL CONSUMPTION.

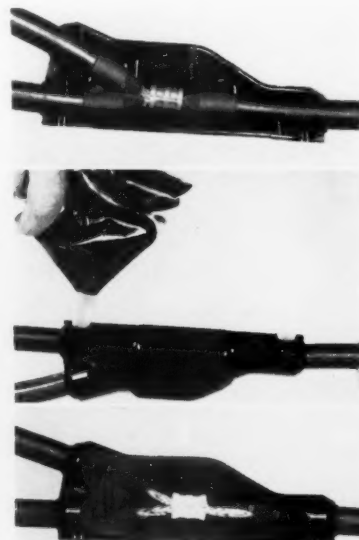
—Write Dept. B, VAN DER HORST CORP., OLEAN, N. Y.—

OLEAN, NEW YORK
HILVERSUM, HOLLAND
CHICAGO, ILLINOIS



TERRELL, TEXAS
LOS ANGELES, CALIFORNIA*

*SparTan Engineering



Cable Splices In Epoxy Resin

Embedding tap or branch electric cable splices in epoxy resin is now possible using a new Scotchcast splicing kit. Splices can be insulated in the field in less than 10 min. Once a splice has been cast, it is permanently encased in a block of insulating resin which, the manufacturer states, will remain solid and watertight despite aging, heat and pressure.

The kit consists of a two-piece plastic mold, two plastic spouts, strips of sealing tape for the mold joints and a Unipak container of epoxy resin. *Minnesota Mining & Manufacturing Co., Dept RLC, St. Paul 6, Minn.*

Air Impact Wrench

A completely new mechanical design enables the Sioux wrench to deliver as much as 15 per cent more torque while consuming 30 per cent less air. With 90 psi air pressure at the wrench, Model 315 delivers 120 torque ft-lb in 10 sec; Model 317, 185 torque ft-lb in 10 sec. Powdered iron bearing surfaces on motor end plates wear longer and permit a

(Continued on page 64)

made stronger to last longer



SHOT PEENING creates a thin, cold worked layer that, in effect, causes the spring to operate at lower stress. Shot peening also erases tiny surface imperfections which could cause stress concentration points leading to spring failure.

Crucible *fatigue-resistant* springs

help keep cars off the repair tracks

Three major railroads report: 90% of all car springs fail due to permanent set — only 10% due to other causes. You can reduce the frequency of failures by using Crucible's single heat treated *fatigue-resistant* springs. They're *made stronger to last longer*, yet cost no more than conventional springs.

Crucible *fatigue-resistant* springs are stronger because they're single heat treated and shot peened. These processes provide better

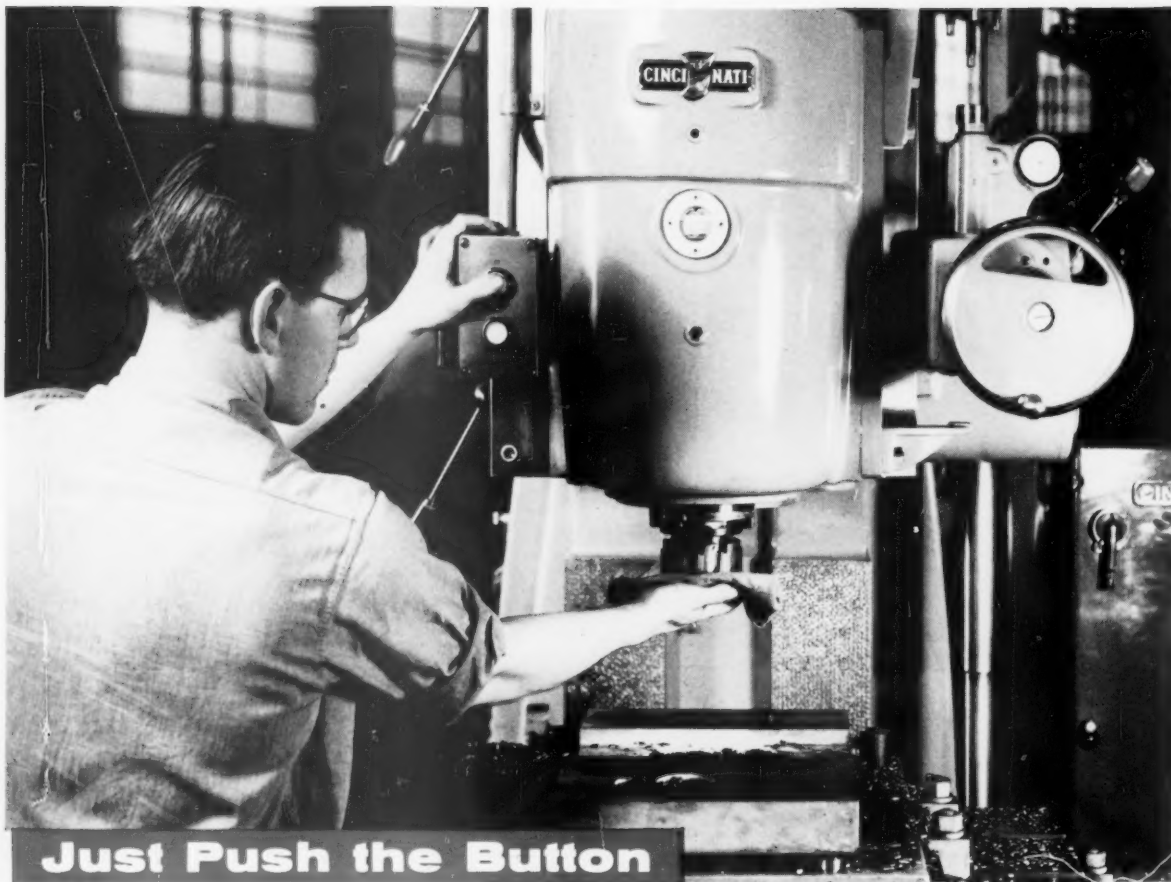
hardenability, higher elastic limits and greater resistance to working stresses.

Help keep cars off the repair tracks and reduce "bad-order" car expenses by using Crucible *fatigue-resistant* springs. They're your best guarantee of long, low-cost spring service. For further details, write for folder: *Spring Division, Crucible Steel Company of America, McCandless Avenue, Pittsburgh 1, Pa.*

CRUCIBLE

spring division

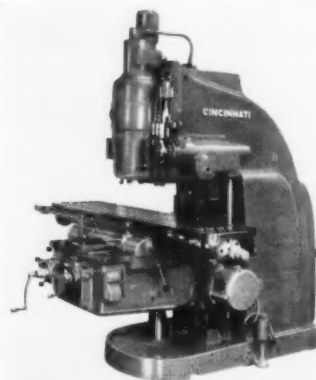
Crucible Steel Company of America



**...Cincinnati power drawbar attachment
does the work of releasing and tightening arbors**

No more tugging and pounding, or climbing up on the table when necessary to change milling cutters for multiple operation work. Cincinnati Power Drawbar Attachment does the job for the operator, instantly, safely. Just push one button and the arbor is tight in the machine spindle; push another button and the arbor is released. This equipment can be applied to all CINCINNATI® High Power and Dual Power Dial Type Milling Machines. ¶ These fine milling machines have many desirable advantages for railroad shops... 24 spindle speeds 100 to 1 ratio; 32 feeds $\frac{3}{8}$ to 90 ipm; power speed and feed selection with a single lever; automatic backlash eliminator; automatic table feed cycles (plain and vertical); power feed to vertical head, and 22 additional advantages outlined in the catalog. Want a copy? Ask for publication M-1917-3. Brief specs in Sweet's Machine Tool File.

**THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO**



**CINCINNATI Vertical Dual Power Dial Type
Milling Machine** equipped with Power Draw-
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GRINDERS • SPECIAL MACHINE TOOLS • METAL FORMING MACHINES
HARDENING MACHINES • CUTTING FLUID • GRINDING WHEELS

C&NW Concentrates at Clinton

New car shop consolidates repairs formerly done at 14 different points on railroad; new cars will be built.

Fourteen months ago, ground was broken at Clinton, Iowa, for the first centralized freight-car repair facility in the Chicago & North Western's history. Covering 32 acres, this \$6 million assembly-line shop will have a capacity for heavy repair of 7,000 freight cars and construction of 1,000 new cars annually.

More than 2,000 cars have already been processed, although construction is not yet complete. Planned new car construction will mark the first time in forty years the railroad will build new cars to supplement cars purchased from manufacturers.

"Consolidation of repair and new construction at one point," said B. W. Heineman, chairman of the board, at the official opening cere-

monies, "permits full use of modern assembly-line methods and mechanization with all production operations under cover for steady output the year around, regardless of the weather." The facility now has a working force of 350 men and under full production, the shop will employ about 500 men.

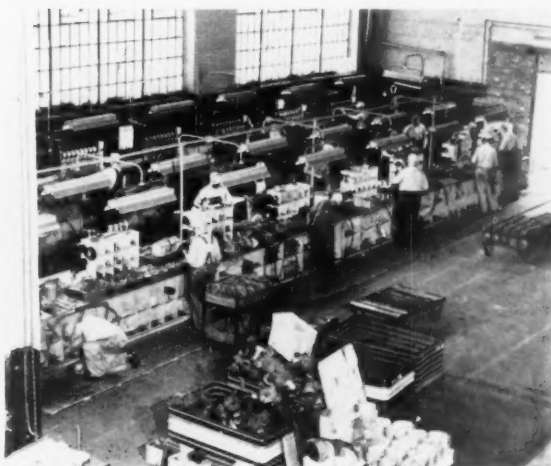
The erecting and fabricating shop, and the paint shop were built over the former Fifth Street Yard. Changes in operations in 1956 concentrated all switching to the West Clinton Yard, west of the car shops. Complete dieselization at the same time, released a number of buildings until then used for steam and diesel repair shops.

Among buildings converted was the locomotive repair shop to a wheel shop, and the machine shop

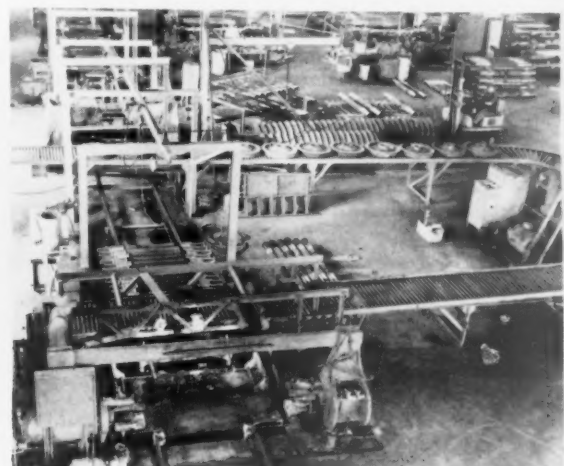
to an air brake and accessory shop. Numerous track changes were also made. New buildings include the erecting and fabricating shop, oil storage facilities, paint shop, and welfare building for employees.

The erecting and paint shops are structural steel, mostly bolted construction, with roof and sides covered with Robertson Galbestos metal siding. Alternate vertical panels of a translucent corrugated fiber glass impregnated with resin are used along the upper sides and horizontal panels on roof. The shops are equipped with Kinnear rolling doors, electrically operated. All outdoor craneways and wheel storage racks are new.

The collecting point for cars needing repairs is the East Clinton Yard, across the river. Some strip-



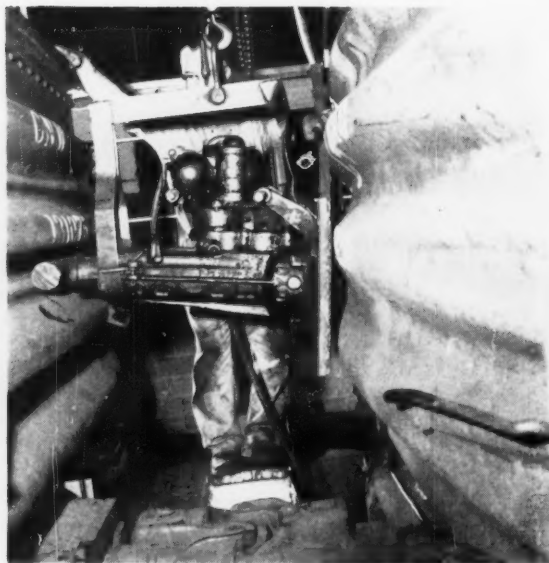
Palletized air brake parts move into shop on right. Disassembly is done on near side of table. Reconditioned and new parts are assembled



on far side—then sent to test rack for service tests. Conveyors, cranes and hoists mechanize wheel shop.



Gondola production line turns out one car every 27 min. Truck assemblies are done on adjacent track. Hydraulic jacks take bow out of ends and sides of cars.



ping is done here, and all cars are sent to the shop generally are of one type or series to permit utilization of assembly-line methods.

Erecting and Fabricating Shop

This is the largest of the shop buildings, 1,000 ft long and 160 ft wide, covering 160,000 sq ft. It is divided into two bays, each 1,000 ft long and 80 ft wide. Each bay has two 10-ton overhead cranes operating the full length for transfer of materials and for raising and lowering cars under repair or construction. The crane runways in the north bay, which has an additional 30-ton crane, extend outside on the east end for 700 ft over a material storage yard covering an area of 56,000 sq ft. This eliminates the necessity of stockpiling materials not immediately used in production area within shop. Land is available for a further extension of 700 lineal feet in this storage area.

Heavy repairs to freight cars are done in this building. The cars are stripped down, depending on the nature of the repairs needed, and rebuilt. Damaged parts are repaired and if too far gone are replaced with new parts. New car construction is also done here. Sufficient trackage is available for work on 60 cars at one time.

The south bay is reserved exclusively for car repair. It has three tracks which continue on through the building, converging into two

of three tracks leading into the paint shop. Work here covers any damage to a car, such as welding or replacing side sheets, replacing floors and sides, straightening or replacing damaged ends. Such parts as wheels and air brakes are checked, and if servicing is needed, they are replaced by serviced parts from the wheel and air brake shops. Outside the south bay at the east end is a new Fairbanks Morse 200-ton car weighing scale 60-ft long. Cars repaired or constructed in the shops are weighed after they are painted and just before final stenciling is applied.

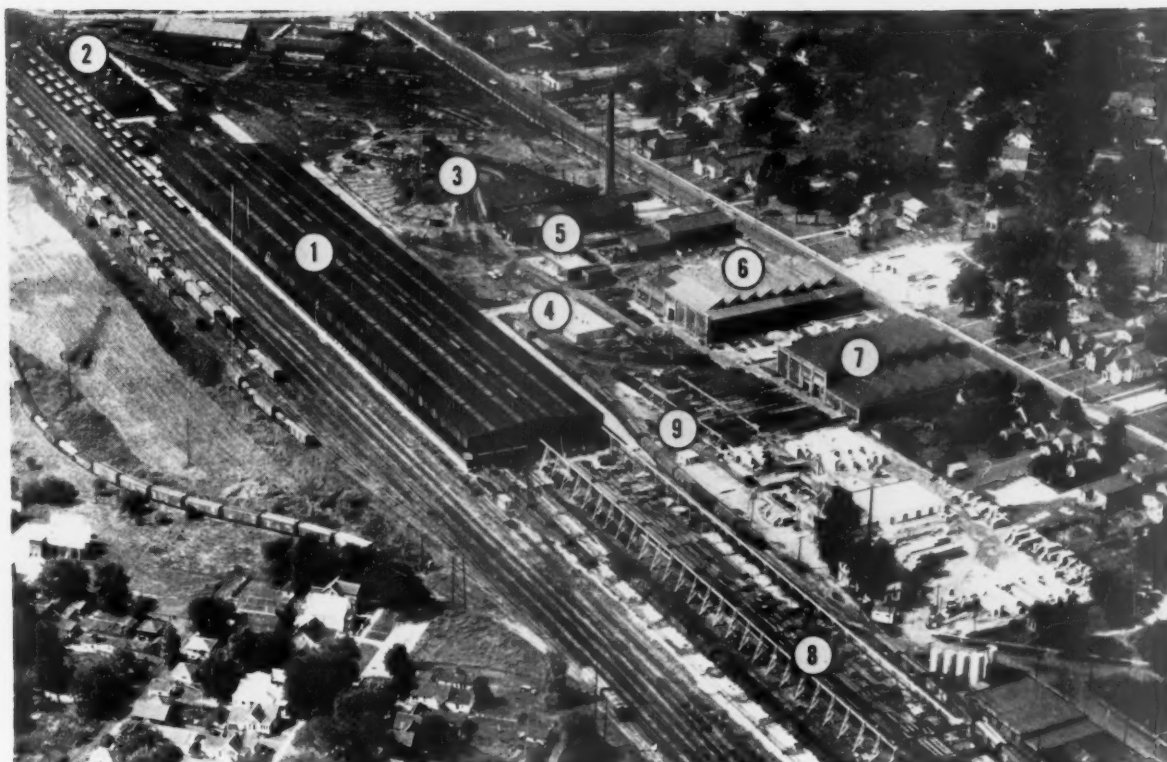
The north bay has one through track which will be used for construction of new cars. This track also leads into the paint shop. Another track comes into this bay about 400 ft from the west end for use in construction of certain car assemblies, and special car work not requiring a full production line. The east end of this bay contains the fabricating department. A variety of forming and punch presses, metal shearing and other fabricating machinery is located here. Foundations are ready for a new Verson 800-ton press for forming ends of gondolas, etc. Other new machines include a Beatty multiple punch for center sills with a 60-ft bed on each side, and a combination Cincinnati punch and shear for handling car side sheets. Welding machines are spaced to advantage throughout the shop. In both bays, the production line

moves from east to west toward the paint shop.

Paint Shop

Four through tracks in the main shop converge into three tracks leading into and through the paint shop. This building is 400 ft long and 60 ft wide, and has a capacity of 24 cars at one time. Electric-powered pullers bring the completed cars from the main shop. These pullers were formerly hoists obtained from dismantled coal chutes. At the east end of shop, cars are treated with hot, dry air to eliminate all moisture from rain or snow. The cars are then sprayed with a protective coating, the paint coming from one central source under pressure. There are 24 stations, for either car cement (heavy asphalt) or standard car paint. Paint is received in 55-gal drums, transferred to tanks and pumped through lines. Tracer lines with forced hot water are adjacent to paint lines, lagged together to keep the paint warm, provide uniform consistency and accelerate drying. Grayco nozzles, pumps and spray guns are used for application of paint.

The system is so constructed that paint keeps circulating in the pipes when not in use. Air, oil, oxygen and acetylene are piped into shop. A color paint scheme assures proper identification of lines. A modern ventilating system, containing filters to trap the escaping paint spray is



Location of the various units at Clinton: (1) Erecting shop; (2) Paint shop; (3) Future lumber storage; (4) Welfare building; (5) Acetylene generating plant; (6) Air brake shop; (7) Wheel shop; (8) Material storage yard; (9) Fuel and oil supply pumping station

provided. To accelerate drying after cars are painted, they are treated with forced hot air at the west end of shop before stenciling. Under full production, the shop will have a maximum output of 40 cars per day. A 40-ft box car requires about 40 gallons of protective coating.

Wheel Shop

This building covers an area of 33,000 sq ft. In addition to the indoor area, substantial space outdoors is reserved for storage of wheel sets and new wheels. Two tracks serve this area, with a 5-ton overhead crane. All wheels and axles, not only for cars going through the main shop, but for all points on the railroad, go through this shop for servicing. Mechanization and assembly-line operations reach a high point in this shop. The wheels and axles travel to and from machines over lines of conveyors designed by North Western engineers. Scrap wheels leave the shop on their own conveyor system. Wheel sets requiring journal attention only are moved to journal

lathes. Other wheel sets with more serious defects have the wheels pressed off, the axles moving automatically over mechanical conveyors to and from machine lathes. Unserviceable wheels are raised on an elevator to an overhead railway where they roll by gravity across the shop and into a scrap bin outside served by a 5-ton crane. Cast-iron wheels are segregated from the steel wheels by a switching arrangement controlled by the operator of the wheel press. Serviceable wheels go into storage for reuse or turning. All axles are inspected by black light for flaws. The wheel shop is still not fully equipped, but present production is about 140 wheel sets per day. With a force of 48 men, the shop is expected to turn out 40,000 sets of wheels per year.

This building covers an area of 38,500 sq ft and is servicing air brake systems for all freight and passenger cars on the railroad. Portions of the shop are for a wood working shop, for a forge and reclamation department, and for a machine maintenance and tool and die department. Partitions will be

erected between the departments. The air brake section replaces twelve air brake servicing points formerly maintained on the railroad. A total of 34 men work on valves, air hose, cylinders, passenger car brakes and other parts of the air brake system. Eighteen men service the AB valves, with an average output of $3\frac{1}{2}$ to 4 valves per day per man. The forge and reclamation section, when completed, will reclaim all usable metal parts such as couplers, hand brakes, brake beams, bolsters, truck sides, etc. The wood mill shop prepares lumber used in car construction.

This building is equipped with two new low-pressure gas boilers with a 5,000 gal underground storage tank to provide stand-by oil for central heating. A third rebuilt boiler is used to consume scrap wood. There are also four electric-powered air compressors with a total capacity of 4,800 cfm; air is piped to all shop buildings.

The new welfare building is concrete block construction with prestressed and precast roof panels. It

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Extreme forward position of king pin support will take care of 38-ft trailer on this car. Decking is 3 in. planks, and is 10 ft 5 in. wide. Car's length is 40 ft; capacity is 70,000 lb. Adjustable winch equipped with cable and chain can be placed in position along H-beam for tie-down of any length trailer.

Monon Designs New Trailer Hitch

Recent tests of a new type of trailer hitch developed by the Monon shop forces at Lafayette, Ind., have been successful with the railroad planning to convert ten additional cars of its forty-one car fleet.

The original forty cars equipped for trailer loading were converted from low-side fishbelly gondolas beginning in 1955. The two top boards on each car side were removed, leaving one board 9½ in. high. This board is tapered at the top and covered with ¼-in. steel plate to protect the sides of trailer tires.

The hitch was developed to simplify the former method of tie-down, and because of the increasing cost to the railroad to replace cables, chains and hooks, which were either lost off the cars, broken, or taken to fasten down trailers on other cars. Loaded trailer tests indicated no need for wheel blocks, which were eliminated together with all winches except two. These are located, one on each side at the opposite end of car from the king pin support. They are each arranged to slide in 5-in H-beams, which are fastened to the outside edges of car, making them adjustable for any length trailer. Each winch is supplied with a length of cable and chain.

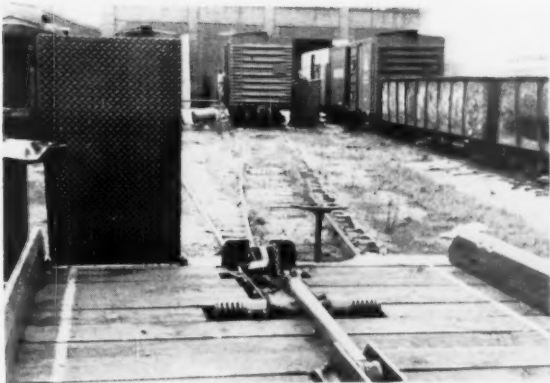
The hitch consists of two main parts. The support member is a 12-in., 40-lb channel, 42-in. in height from the deck to top of support plate in vertical position. At the top of channel to support the king pin bearing of trailer, is a 19-in. by 9-in. by ⅝-in. steel plate, and a 1-in. bottom plate, made in box section, with 1⅝-in. space between. This permits insertion of the king pin lock block machined to fit around the trailer king pin. The rear of the top and bottom plate is cut away in a vee shape to clear the king pin when support is raised in position. The lock block is held in place by a 1⅝-in. square transverse toggle pin.

The bottom sides of the channel-support member are built-up to 1⅞-in. thickness on both sides, with a 1⅝-in. dia., steel shaft, extending outward on each side, and welded to the inside reinforced channel. These shafts fit in bearings 5-in. long, located 22-in. apart for lateral stability, made of ¾-in. plate and welded to a ¾-in. base plate. The base plate is riveted to the bolster cover plate. To provide ease in raising the support in position, one shaft is fitted with a coil spring, under tension when the support is

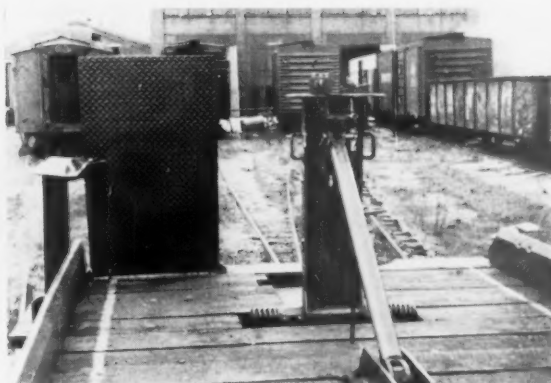
in lowered position. This one spring eliminates one of the dual springs used on the first car equipped.

The diagonal support strut is 3½-in. double extra heavy steel tubing, with a clevis and toggle-pin arrangement at top. The toggle-pin connects the clevis 8-in. from top of support to a steel plate gusset, welded on center line of channel. The clevis on the other end is pin-mounted to a vertical steel plate welded to a 12⅞-in. by 8⅞-in. by 2¼-in. follower plate. This follower slides in a box formed by a bottom plate recessed down 2⅞-in. between the center sills and a top plate, flush with top of center sill. The two plates are bolted transversely together through 4-in. by 4-in. angles between the center sill. The top plate is riveted longitudinally to angles on each side of center sill. At each end of the follower plate is a rubber snubber, 2½ in. long by 8⅞ in. wide, consisting of two steel plates vulcanized to a rubber insert. This arrangement permits a maximum of 1¼-in. compression to take up longitudinal shock.

The toggle-pins used in the assembly eliminate the use of cotter keys, bolts, etc. When the pin is inserted in place, the end drops



Trailer hitch in lowered position. Equipment will be further recessed on future cars to permit other kinds of loading.



King pin support is spring loaded to provide easy positioning. Diagonal strut base is snubbed by rubber inserts to absorb longitudinal shocks.

down and holds pin in position. Both pins and king pin block are fastened to the support channel by chains to prevent loss. It is estimated the new equipment for each car

will cost about \$200.00 to manufacture.

The cars are equipped with ASF trucks with snub-up snubbers, 5½-in by 10-in journals, 33-in CI

wheels, Stucki side bearings and Miner draft gear. Also included are cast steel bolsters, bottom rotary couplers and drop wheel hand brakes.

C&NW Concentrates at Clinton

(Continued from page 29)

is equipped with lockers, Bradley wash fountains, and showers. Salt glazed tile is used in the washroom. A two-story office building contains offices, drafting rooms, with part of the first floor containing supplies of small parts, such as valves and fittings. The fuel and oil supply pumping station has two 20,000 gal underground tanks, providing fuel for heating the paint shop and for forges, rivet furnaces and heat treating furnace.

An acetylene generating plant

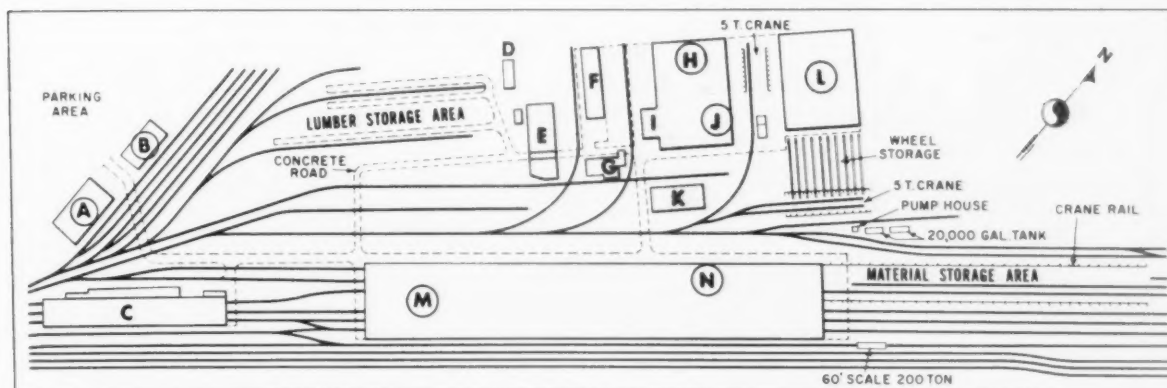
has two new Linde generators to manufacture gas from bulk carbide where it is piped to all points in the shop.

Material Handling and Supplies

Over 9,000 items are kept on hand for the various operations. A production and material control system is in operation to provide precise scheduling and coordination of production, purchasing and warehousing. Mechanized material handling techniques are used to the full-

est extent. A new fleet of fork-lift trucks is used to handle unit loads, with most suppliers furnishing them palletized.

For the first time in the history of the company, lumber is being received in banded units for mechanical unloading, with accompanying reduction from 48 hr to 2 hr in time required for unloading a car. The lumber storage area will be on ground now occupied by the roundhouse. It will be served with three tracks, including one stub, with concrete road ways for fork lift use.



Utilization of existing facilities along with the new car shop and paint shop structures has produced this plant at Clinton. Areas devoted to various operations include (a) template room, (b) template storage, (c) paint shop, (d) garage, (e) power house, (f) office

and storehouse, (g) acetylene generator, (h) air brake shop, (i) wood mill, (j) forge and reclamation shop, (k) welfare building, (m) assembly and fabrication shop, and (n) fabricating area. C&NW formerly repaired steam locomotives here.

First All-Welded Aluminum Box Car Doors

The first completely welded aluminum box car doors to be built in the United States are in service on the Pennsylvania Railroad. Six of an order of fifty doors developed by Kaiser Aluminum & Chemical Corp., have been applied to existing X-46 box cars and the remaining forty-four are being installed on X-52 box cars with loading devices.

The principal reason for using aluminum is to reduce weight—a factor of increasing importance with the trend to wider doors. Aluminum also gives a door that is not expected to require replacement of parts due to rust or corrosion.

The cars will be used in general service and on captive runs in merchandise service where maximum operating experience will be encountered in frequent opening and closing operations. The actual weight, as designed, of the 8-ft aluminum door is 256 lb as compared with 523 lb for a steel unit. In addition to making the door easier to operate, this weight reduction is also expected to reduce abuse to the door from two stand-points: (1) The light weight will minimize the need for sledges, crowbars and other aids to opening and (2) abuse from road and switch shocks is lessened if the door is left open during movement.

The aluminum material selected for this application is 5086, an unusually strong corrosion-resistant, and highly weldable alloy developed by Kaiser Aluminum. The strength of 5086, which contains magnesium and manganese, is achieved by work-hardening during rolling, rather than by heat treating. This alloy offers greater strength after welding than other common alloys, having a welded joint efficiency approaching 85 per cent.

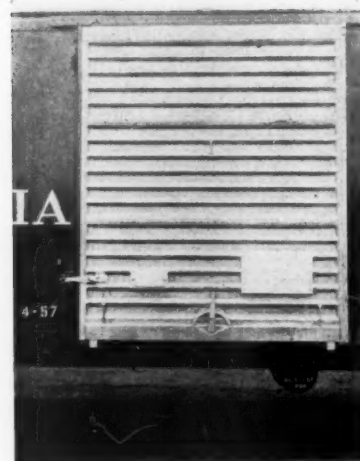
The door has actual overall dimensions of 8-ft 4 $\frac{5}{8}$ -in. by 10-ft 1 $\frac{7}{8}$ -in., and consists of three standard horizontally corrugated panels

joined to a reinforcing frame of shaped and extruded sections. The bottom and center panel sections are 96 $\frac{15}{16}$ -in. wide by 39 $\frac{5}{16}$ -in. high and contain six 5 $\frac{31}{32}$ -in. corrugations. The top section has five corrugations and is 32 $\frac{11}{32}$ -in. high. A flat surface 1 $\frac{1}{2}$ -in. wide on the sides and 1 $\frac{3}{4}$ -in. at top and bottom of each section, permits die hold-down and trim during fabrication, and lapped joints with other members in later assembly.

Rivet holes are punched in the corrugated center and bottom panels for the door fixtures. Several ridges of the bottom panel are flattened to provide a recessed surface for the tack board and to facilitate operation of the lifting lever.

The aluminum frame has seven components—front and rear edge extrusions, front and rear vertical reinforcing plates, top and bottom edges and a bottom reinforcing plate. The extrusions are designed to utilize lapped joints with adjacent sheet parts, and to give maximum rigidity and strength to the completed assembly. The design is said to offer a better seal than the corresponding members of an all steel door, and to withstand impact against door frame members when door is closed or opened.

The front extrusion is provided with a flat, reinforcing leading edge to distribute the shock of impact, and to form a seal when the door is closed. A second seal is formed at the edge of the front door post zee by the inner surface of the door frame. A double seal is provided at the rear edge of door by the extrusion, which is designed to slide past and engage a tongue of metal extending from the door post, and a stainless steel sparking strip, 1 $\frac{7}{8}$ -in. by 121 $\frac{5}{8}$ -in., that extends from slots in a rear vertical reinforcing plate and rests against the top of the metal tongue. The flat surface of the rear extrusion trailing edge im-



Corrosion and rust free, this all-welded aluminum door is over 50 per cent lighter than conventional steel units. It was fabricated by the Youngstown Steel Door Co. and applied at Pennsy's Altoona shop.

pinges at top and bottom against stops when door is fully opened.

The upper edge of the door is formed from $\frac{1}{8}$ -in. sheet, and the bottom edge is $\frac{3}{32}$ -in. sheet. The bottom reinforcing plate, formed from a 0.109-in. sheet, runs horizontally along rear of door at the bottom where it completes the covering for the door roller assembly. The lower end of the spark strip is anchored 1 $\frac{1}{4}$ in. from the rear by offsetting the reinforcing plate $\frac{1}{8}$ -in. and raising two $\frac{3}{8}$ -in. tabs $\frac{31}{32}$ -in. in from each side.

Assembly of the doors is accomplished in a simple jig arrangement. Standard malleable iron door fixtures are installed with hot-driven steel rivets. Future doors undoubtedly will have forged aluminum hardware. Forty of the doors are equipped with standard steel rollers with lubricated anti-friction bearings. The remaining ten doors, for test purposes are equipped with Zytel "101" nylon rollers, which do not require lubrication or anti-friction bearings.

Possible electrolytic action between the aluminum and ferrous parts on the existing doors is prevented by a coating of zinc chromate primer on the aluminum and a non-lead-bearing primer on the steel and iron. A layer of Alumi-lastic paste is applied for added protection before joining the dissimilar metals.

The field experience gained through daily use of these fifty cars
(Continued on page 62)

Fumigation: A Solution to Low-Grade Fuel Use?

The effects of introducing a portion of the fuel charge of a diesel engine into the intake manifold in the form of a fine mist have been investigated by the engineering research department of the Pennsylvania State University. Although small, single-cylinder, laboratory-type diesels were used, results have been such that the Pennsylvania Railroad has tests underway to develop equipment which will introduce fuel into the manifolds of its locomotive diesel engines. This may enable them to burn poorer grades of diesel fuel.

The process of introducing fuel through the intake manifolds is known as "fumigation." Laboratory tests with a swirl-chamber and an open-chamber engine resulted in smoke reductions up to 80 per cent, increased the smoke-limited power output up to 18.5 per cent, decreased specific fuel consumption up to 9.8 per cent, shortened ignition lag, lowered maximum rate of pressure rise, and produced smoother, quieter operation. In running on good grade diesel fuel, approximately 15 per cent of the main fuel proved to be as good a manifold fuel as any. It was also found that a diesel engine could operate satisfactorily on substandard fuels down to 0 cetane number when fumigation was employed.

Maximum benefits from fumigation came when inducting fuel in the form of a very fine mist (not over four microns) produced by "Micro-Fog." As yet an economical method of producing this finely atomized fuel spray in large quantities has not been found. However, significantly improved performance was also obtained by the use of inexpensive pneumatic spray nozzles that require only a small amount of low-pressure air for operation.

Abstracted from "Fumigation Kills Smoke, Improves Diesel Performance," by M. Alperstein, W. B. Swin, and P. H. Schweitzer, Pennsylvania State University. Presented at the recent SAE National Diesel Engine Meeting, Cleveland, November 6, 1957.

The outstanding advantage of the diesel engine is its fuel economy which derives from the facts that the diesel compression ratio is roughly double that of a modern automobile engine and that the diesel can burn a lean mixture which a spark is unable to ignite. In most other respects, however, the diesel is inferior to the Otto cycle engine. In the latter, the fuel and air are mixed before they enter the cylinder, most of the fuel is in vapor phase at the time of ignition; a rather rich mixture can be burned without thermal decomposition. Carburetor engines generally do not smoke. Finally, the spark plug is able to ignite fuels of low ignition quality which, in a compression-ignition (diesel) engine, would ignite too late or not at all.

Fumigation described in this paper represents a little step away from the diesel engine in the direction of the Otto engine, a step which preserves diesel's advantages and alleviates two disadvantages: incomplete mixing of air and fuel, and late combustion caused by long ignition lag.

The method broadly consists of introducing part of the fuel in the form of a fine mist, or fume into the intake manifold while the rest is introduced in the conventional manner through the high-pressure injection system into the cylinder near top dead center position of the piston.

Manifold introduction of fuels into a compression-ignition engine was experimented with at Penn State as early as 1941. In this and subsequent researches, the main fuel was injected into the diesel cylinder in the conventional manner and a smaller amount of auxiliary fuel (diesel fuel, gasoline, alcohol, benzene, etc.) was introduced into the intake manifold as an aid to combustion. Other researchers carburetted alcohol as a main fuel and injected small amounts of diesel oil and various vegetable oils to ignite the compressed air-alcohol vapor

mixture. In this manner they successfully burned alcohol which otherwise could not be ignited by compression ignition. A similar scheme was used in the last war by the German air force.

In the last instances the main fuel was introduced through the intake manifold and a relatively small amount of auxiliary fuel injected. But ignition was always released by the injected fuel. In fact, without the injection of a liquid jet, the gaseous main fuel would not ignite at all, except at a very high compression ratio.

Recently fumigation of high ignition quality fuels has been used to help burn low ignition quality fuels which, without fumigation, would burn only sluggishly, or not at all.

Previous investigators used injection nozzles or carburetors to introduce the supplementary fuel into the intake air. Such devices give rather coarse sprays with a mean drop size of 20 microns or more. The present investigation also employed an apparatus (Micro-Fog) which produces a very fine mist consisting of droplets under four microns. This gave amazingly good results.

Test Equipment

Most tests were performed on a single cylinder CFR cetane test engine and some on a single cylinder Petter AVA-1 diesel engine. Supplementary fuel was introduced by four different methods:

- Mist generator—an experimental model of the commercial "Micro-Fog" lubricator made by C. A. Norgren Company. Liquid is atomized by air jets and is then carried by the air through a series of separator passages where the heavier droplets are removed.

- Pneumatic atomizing nozzle—made by Spraying Systems Company. The fuel rate was controlled by a needle valve, and air at 10 to 15 psi passed through an annulus around the fuel nozzle and imping-

(continued on page 54)



Transit Cars Have 'Air Ride' Trucks

Trucks with self-leveling air springs keep cars level and adjust accelerating and braking rates to compensate for passenger load

The first application of its kind to rapid transit service, the Metropolitan Transit Authority of Boston now has 50 new cars built by Pullman-Standard at the Worcester, Mass., shops, equipped with trucks having a combination of coil and air springs. A somewhat similar design of air springs only was used by Pullman-Standard on its New York Central Train-X (RL&C, June 1956, page 53).

The cars will operate in pairs, forming 25 two-car sets. Each car has a motorman's cab at one corner for multiple-unit operation in trains from two to six cars, serving Boston's busiest run between Everett and Forest Hills. An additional order of 25 two-car sets are scheduled for 1958 delivery.

The truck design includes a self-leveling air spring bolster suspension, incorporating a combination of helical springs and rubber bellows. The helical spring in the bellows takes the weight of car unloaded, while the air bellows adjusts to the load and takes the proper height to keep the car level under all operating conditions. This is true whether the car is loaded to

capacity, or has only a few passengers on one side or at one end of car. The air spring system actually weighs the car. It automatically adjusts accelerating and braking rates to compensate for the loads.

The trucks are General Steel Castings Corporation's cast steel, four-wheel, inside bearing, non-equalized motor trucks, with a 6-ft 10-in. wheelbase, 5-in. x 9-in. journals, 28-in. solid steel wheels. There are lateral shock absorbers, vertical snubbers and helical journal box springs. Each truck is designed to carry a maximum center pin load of 32,000 lb. Hypoid gears are used in the power transmission. There are four self-ventilated 100-hp. General Electric 1250 motors per car, one motor for each axle.

The motor is a direct-current, series-wound, self-ventilated machine, rated 100 hp for one hour, when operating on 300 volts. Utilization of advanced design and manufacturing techniques gives a greater power output in a smaller size. Comparison with the 100-hp motor now standard on the New York City Transit Authority cars shows the new motor to be 630 lb lighter, 5 in.

shorter in overall length, and 5 in. smaller in diameter.

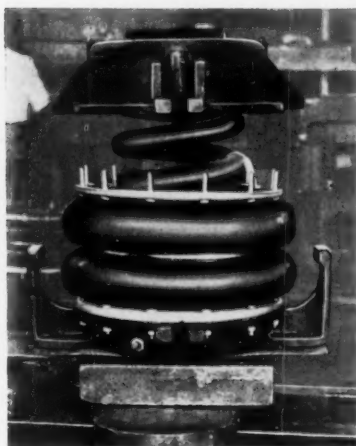
The new motor is essentially the same as the one previously designed for PCC car application, but it has almost double the rating. Along with their MCM controls, these GE 1250A1 motors are being used for the first time in transit service.

Electrical Controls

A high-performance, all-electric control was developed for use on the cars. The control is of the motor-cam-magnetic (MCM) type. It consists of magnetic contactors and relays, and cam-operated contacts which perform the car accelerating and decelerating functions.

The cam-operated contacts are mounted on two controllers. These, in turn, are mounted one on each side of the main resistor box. Each controller camshaft is driven through its individual reduction gear unit by its own automatically controlled d-c motor. One controller is designated as the resistance controller. Its function is to change resistance in series with the traction motors. The other controller is

This Spring Levels the Car . . .



Coil springs have capacity of 74,000 lb at 12-in. working height; carry light weight of car. Spring is compressed during assembly.

designated as the circuit controller. Its functions are to establish the traction motor circuits for motoring and braking; adjust traction motor field strength; and connect the traction motor fields for forward or reverse operation.

Electro-pneumatic and extended dynamic braking are used. The electro-pneumatic system includes a unit brake with Cobra shoes applied to every wheel in the train. Maximum use is made of dynamic braking. At a low pre-determined speed,

the electro-pneumatic brakes automatically blend in with the diminishing dynamic brakes to bring the car to a complete stop. Electro-pneumatic braking is used also for emergency applications.

The cars are welded, all-steel construction, with curved sides and outside sliding side doors. They are equipped with a third rail shoe equipment, but provision is made for possible future application of overhead pantographs. Ventilation is furnished with four axiflow fans

per car delivering a total of 12,000 cu ft of air per minute, at maximum speed. The cars are heated electrically by resistance heaters, using the heat generated by the accelerating and braking resistors. The heat is supplemented by 25-kw auxiliary heaters, located in ducts underneath the car. An electronic system provides control of both heat supply and ventilation fan speed.

Each car is equipped with 54 incandescent ceiling fixtures, 23 on each side and 8 on center line, using 20-in. series 36-watt lamps of the short circuiting type, mounted in short-circuiting sockets. Each lamp provides four times the light given in existing cars. Drop sash windows are provided at side of operator and in end door at guard's posts. All other exterior sash are stationary with single light of $7\frac{1}{2}$ -in. thick safety glass set in rubber moulding.

The interior color scheme presents a striking appearance through use of decorative green, coral, tan and brown plastic materials and stainless steel in combination with limited painted surfaces of oyster white and terra cotta. The plastics are easily washed, and since the colors are built into the materials, maintenance is easy. The head-lining is $\frac{1}{8}$ -in. solid micarta, green mottled design, with stainless steel snap-on mouldings.

Advertising cards are framed with stainless steel mouldings. Inside window frames are integral moulded units of medium green re-inforced plastic from side finish in window area. Stainless steel snap-on vertical mouldings are used at joints. At the side door openings, the pier panels are provided with cream-colored melamine surface phenolic board, the upper portion of which provides an 'order of station' sign.

Longitudinal seats are used, with spring cushions and padded backs upholstered with heavy-duty vinyl of alternating coral and turquoise. The seat frames are stainless steel provided with louvers and form part of the heating and ventilating duct system.

The cars are each 55 ft over the pulling faces. Overall height is 11 ft 11-in., and width is 8 ft 11 $\frac{3}{4}$ -in. Seating capacity is 48; standees are rated at 179. The empty car weighs 58,550 lb and when loaded with 227 passengers it will weigh 90,250 lb.

Manufacturers Supplying Specialties and Equipment

American Steel Foundries	Contact shoes
Bethlehem Steel Company	Wheels and axles
B. F. Goodrich Co.	Floor covering
Consolidated Metal Products Co.	Door control equipment, auxiliary heaters, 600-volt switch panels
Dana Corporation	Hypoid gear units and propeller shafts
E. I. DuPont de Nemours & Co.	paint
Electric Service & Manufacturing Co.	Tail lights and defrosting fans
Elcon Company	Door hangers and handholds
General Electric Company	Motor and control equipment
General Steel Castings Corp.	Truck frames
Heywood-Wakefield Company	Seats
James L. Howard & Company	Miscellaneous door hardware
J. W. Mortell Co.	Undercoating
Lovell-Dressel Co.	Marker lights
Luminator, Inc.	Car body and emergency lights
Minneapolis-Honeywell Regulator Co.	Heating and ventilator controls
National Brake Co.	Hand brake
Ohio Brass Company	Coupler and draft gear equipment
O. M. Edwards Co.	Motorman's side sash and doors
Railroad Friction Products Co.	Cobra brake shoes
SKF Industries	Journal boxes
Thomas A. Edison Co.	Storage battery
U. S. Plywood Company	Micarta headlining and steel-faced plywood floor
Westinghouse Air Brake Company	Air brake equipment
Westinghouse Electric Corporation	Roof ventilating fans and 32-volt switch panels

PROBLEM PAGE

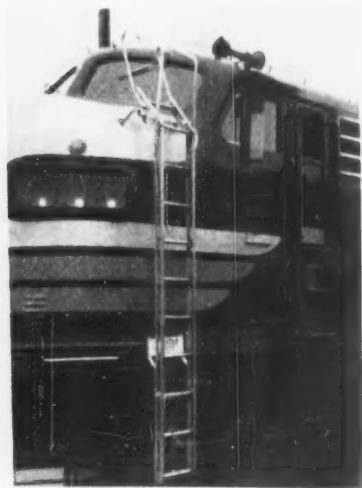
Cleaning Road Locomotive Windshields

What have you found is the most successful way to clean the windshields of streamlined road passenger and road freight locomotive units? Should units be equipped with ladder brackets and hand-

holds? Should cleaning be done from trackside platforms? Can it be done from the ground? Should intermediate division points do job in a different way than terminals?

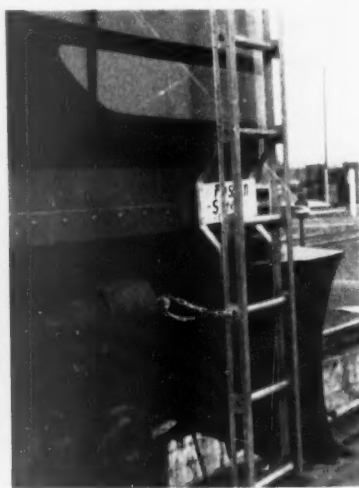


Burlington units have runboard and ladder built on them to facilitate cleaning.



USE ALUMINUM EXTENSION LADDER. Where trackside platforms are not available, the most successful method found by one western railroad for cleaning windshields of diesel road locomotives is an aluminum extension ladder angled at the top to suit the curvature of the nose.

It is fitted with handrails at the



top to assure the cleaner's safety in alighting from the ladder to clean the windshield. The ladder is clipped on to a handhold mounted on the nose close to the windshield and held close to the side of the locomotive at the lower end by a safety chain which can be fastened to a lug on the air-brake cylinder.

PUT BRACKETS ON DIESELS, by S. L. Fee, vice-president—operating department, Chicago, Burlington & Quincy, Chicago. We feel the best method for cleaning windshields both at terminals and intermediate points on road passenger and freight locomotives is washing with hot or cold water, depending on the condition of the windshields, and wiping with towels.

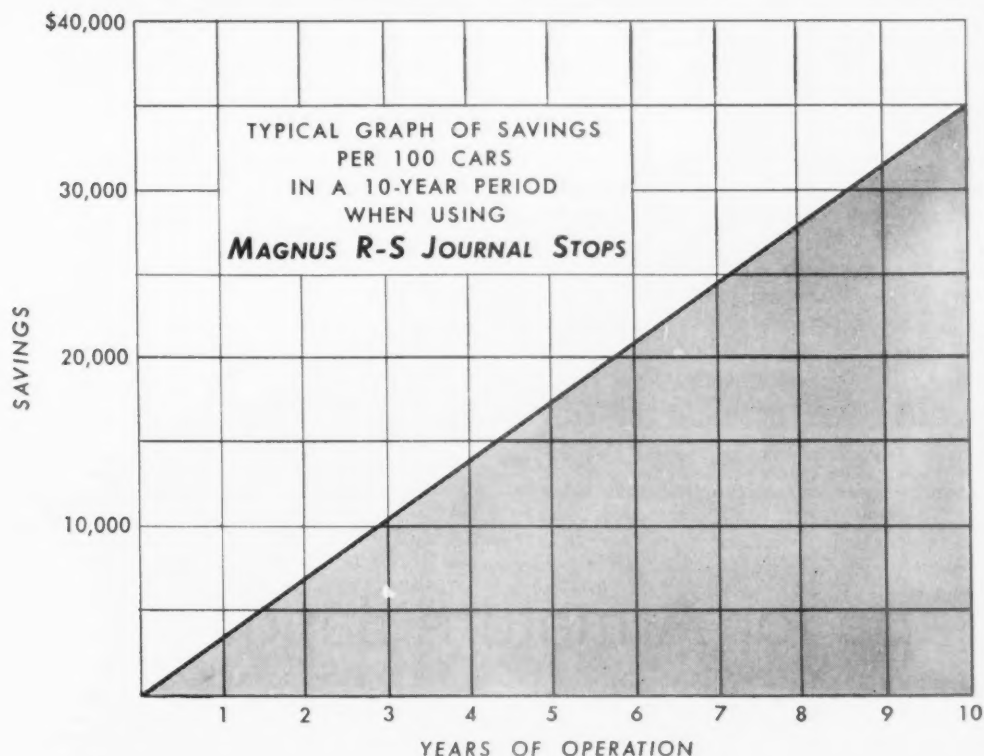
Locomotives should be equipped with ladder brackets and handholds. Windshields cannot be properly cleaned from the ground.

Track-side platforms are not considered necessary, particularly if units have been equipped with the ladder brackets and handholds.

NON-SKID TREAD HELPS. Northern Pacific has ladder brackets, handholds and non-skid treads on the tops of the noses of its road locomotives to give easy, safe access for cleaning the windshields. This has proved quite satisfactory on road locomotives going through where crews change, or at diesel repair points where raised platforms are not available.

SOAP-AND-WATER DOES THE TRICK. Southern Pacific, San Francisco, reports that windshields on stream-lined road passenger and road freight units are cleaned with soap and water from trackside platforms at maintenance terminals. Units are equipped with ladder brackets and handholds to facilitate cleaning at intermediate division points. This does necessitate the use of a ladder, and man must climb up on the nose of the locomotive, the construction and contour of which does not permit cleaning windshields from the ground.

TAKE A GOOD LOOK AT JOURNAL-STOP SAVINGS



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An investment in Magnus R-S Journal Stops will save you over \$35.00 per car per year — will return the complete cost of the Stops in less than 3 years.

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service attention, double bearing life, reduce wheel flange wear, and eliminate false brake piston travel. Equip all freight cars with R-S Journal Stops — and railroads will save \$70,000,000 per year in freight car operating costs.

For complete information on the low-cost way to get better bearing performance, *and fast*, send for "Design and Performance Data on Magnus R-S Journal Stops", Magnus Metal Corporation, 111 Broadway, New York 6; or 80 East Jackson Blvd., Chicago 4.

*Cost based on data compiled by the Mechanical Division of the Association of American Railroads in 1955 as revised by the Technical Advisory Committee of Bearing Manufacturers to correct for bearing consumption.

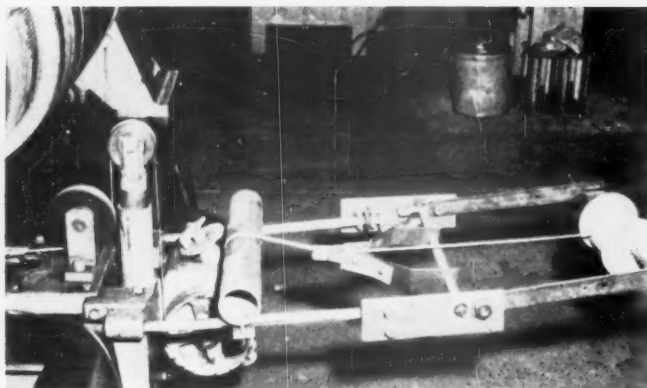
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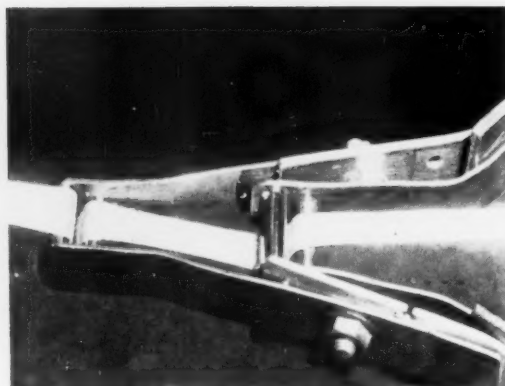
Subsidiary of **NATIONAL LEAD COMPANY**



ELECTRICAL SECTION



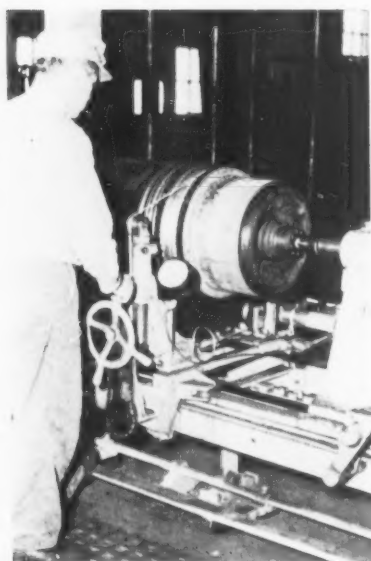
Tape from the spool goes through straightening device, over the pipe, down under and around tension wheel, over wheel on the tension measuring piston, under two guide pulleys, only one of which is shown and over a third from which tape is



fed on to the armature. Above: Straightening device, made with smooth fixed pins but no rollers, insures the tape going flat onto the armature.

Glass Tape for Armature Banding

The Milwaukee now has about 40 traction motor armatures in service on which glass tape has replaced steel wire for banding and is adding two per week.



As the tape is drawn on by the rotating armature, it is fed in even laps by the operator who moves the machine carriage laterally with the hand wheel.

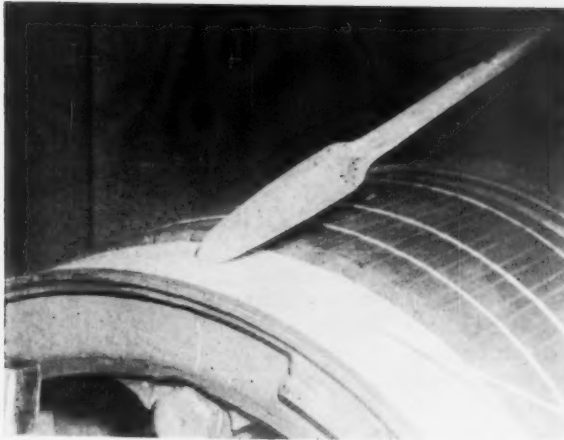
WORK NOW BEING DONE in the Milwaukee, Wis., shops of the Chicago, Milwaukee, St. Paul & Pacific indicates that traction motor armatures stalled in a snarl of banding wire may become a thing of the past. Steel banding wire is being replaced with glass tape and there is every indication that costs will be reduced, insulation will be improved and that the life of armature coils will be extended. Of course, the magnetic effects of the banding wire will be eliminated.

The tape consists of parallel glass fibers in self-polymerizing varnish. The Milwaukee's device for applying the tape is a converted banding machine. Tape from a spool is first drawn through a straightening device to assure its being applied flat. It then passes over 65 per cent of the surface of the tension wheel on the tension device originally designed for banding wire.

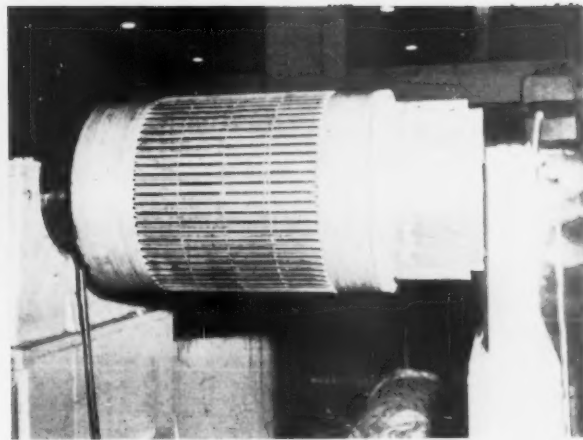
From the tension wheel the tape is run over a pulley on the end of a piston in an oil-filled cylinder. This develops oil pressure which registers in pounds tension on a gage in front of the operator. Finally, the tape goes over a guide pulley onto the armature. The pulleys are crowned and flanged.

For applying the tape, the operator moves the machine carriage horizontally as the tape is wound onto the armature. Four layers are applied at a tension of 125 lb on each end of the armature or enough to use one spool of tape per armature. The tape shrinks seven to eight per cent on curing, which insures added tightness.

The tape used is supplied by the Chicago Printed String Company, and is known as CPS Res-i-glas. It is made of Owens-Corning, non-woven, parallel glass yarns impregnated with General Electric Perma-



When the band is complete, the trailing end of the tape is secured by a touch of a hot soldering iron.



A finished armature after dipping and baking complete with glass bands including the string band.

fil polyester. The trailing end of the tape is secured initially by touching it with a hot soldering iron.

No insulation is used under the glass bands. The tape bonds to itself after 20 minutes at 125 deg C, with complete cure effected after baking for three hours at this temperature. The applied tape conforms

with irregularities of the coils preventing chafing of the coils under the bands.

Balancing is not a problem since most balancing is done at the ends of the armature. For armatures, other than traction motors, balancing weights may be secured to the tape in the form of lead shot or

lead sheet held in place under a patch of glass tape.

After taping, armatures are dipped in GE9700 varnish and baked eight hours or overnight at between 250 and 300 deg F.

The tape is also applied by hand for string bands at the outer end of the commutator.

From the Diesel Maintainer's Note Book

Remember Number 5

By Gordon Taylor

A GP-7 UNIT was dispatched from a secondary maintenance point as a single-unit locomotive in freight service. Everything was apparently in good order. However, before the unit moved five miles, it was in trouble. The engine would insist on stopping in the No. 5 throttle position.

The crew did not remember how to handle such a case. Probably the road foreman had failed to advise them how to meet such a situation. In any event, the crew phoned the roundhouse, from which they had so recently departed, for a relief engine.

This series of articles is based on actual experiences of men who operate and maintain diesel-electric locomotives.

Just at that point, it would have been a fine thing if the foreman or maintainer could have suggested something that would have cleared up the trouble. Helpful ideas seemed to be missing that night, so preparations were made to run a relief engine.

The crew, having to wait so long for another engine, started experimenting with the defective engine. The fireman started the engine and, operating it from the layshaft, found that the engine could be speeded up, and seemed to have gotten over its scare of throttle No. 5. In other words, the trouble seemed to have disappeared but, since the crew did not know what they had done to correct the trouble, they did not wish to proceed with a unit that might fail again.



In the meantime, the relief unit had arrived and proceeded with the train. The defective unit was operated under its own power back to its dispatching point.

At the roundhouse, it was carefully inspected, but nothing definite could be found to explain the delay. Arrangements were made to operate the unit a full shift in yard service to see if it would fail. That test revealed no trouble, so the next night the unit was dispatched in road service and made a successful trip.

(continued on page 52)

HOW MUCH DO YOU KNOW ABOUT BRUSHES?

How Does Environment Affect Brush Operation?

THE PERFORMANCE OF BRUSHES is known to be related to the presence of a constant film of moisture on the commutator. In engineering terms, this condition is known as the Beilby layer theory. Under the conditions to which brushes are normally subjected, this film exists on commutators until the relative humidity or moisture content of the atmosphere drops to a level less than 5 per cent. This condition is practically non-existent in railroad operation. However, there is evidence to indicate that brush performance is improved by higher relative humidity because of better commutator filming.

Heat is a factor which tends to reduce the effect of atmospheric moisture by raising the minimum relative humidity level at which a moisture film will be retained on the commutator. Fortunately, in railroading it is doubtful if sufficient temperature is ever encountered to cause this condition; certainly not under normal commutator temperature conditions.

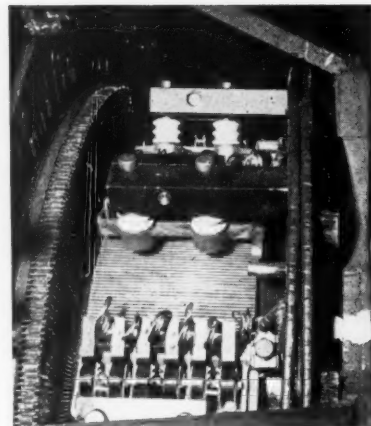
Dust of a non-conductive type causes brushes to wear rapidly when it can enter the machine as is usually the case in severe dust storms. It destroys the commutator film and can thus be responsible for brush chatter and breakage, and possibly flashovers. Conductive dust of a magnetic nature such as iron ore can cause flashovers and commutator trouble from short circuited bars in addition to those troubles associated with non-conductive dusts.

Corrosive gasses such as sulfur, coal smoke, chemical fumes, etc., are harmful to commutator films. They can result in excessive film formation leading to smutted and burned bars, or film stripping leading to commutator ridging and threading.

This is the ninth of a series of questions and answers which are appearing each month.

Oil vapor pulled through the machine with the cooling air inevitably deposits a dust collecting film on the commutator, risers, and other internal parts. Normally the very slight amount of copper or carbon dust present at any given moment in a commutating machine is efficiently carried out by the cooling air. However, if the risers and other parts are coated with an oil film, the conductive particles build up thus providing an excellent pathway for a ground at any point where the insulation may be cracked. On the commutator, the presence of an oil film can cause the gradual formation of a lapping compound composed of dried oil and dust. Particles are sloughed off the brushes and commutator as dust in normal operation but these particles mixed with oil vapor make a lapping compound similar in effectiveness to jeweler's rouge. This material is sometimes responsible for the grooving and threading encountered on a given machine equipped with a brush grade that is performing satisfactorily on other similar machines in the same unit pool. The oily mixture can also cause bar burning by short circuiting between bars. This is one known source of 180-deg bar burning. Rather than tolerate the expense (and potential source of brush trouble) connected with spraying and drenching the machine with solvent to remove the oily film, it would seem more economical in the long run to prevent the entry of oil vapor.

Altitude conditions as indicated by reduced barometric pressure are known to be destructive to the normal type of brush intended for use on land or sea-borne equipment. However, the effect does not become evident, so far as present knowledge indicates, until an altitude of approximately 30,000 feet is reached. Altitude failure of brushes is attended by a sudden



explosive dusting of the brushes at the commutator face and a rasping grating noise as of terrific friction. It is known that the absence of water vapor at high altitude will cause this condition with standard sea-level brushes. Because of the fugitive nature of moisture in brushes, brushes intended for high altitude use are specially compounded to contain a substitute for the filming properties of moisture. There is one point to be borne in mind in the event it seems like a good idea to try a high altitude treated brush grade on diesel equipment. The friction of these brushes is low at altitude, but very high at sea level. The writer knows of one case where an altitude treated grade was placed on a main generator and the solder was promptly thrown out of the risers as the result of the high commutator temperature arising from high brush friction. Based on our present knowledge, there appears to be no reason to consider altitude as one of the major variables affecting brush performance on diesel electric locomotives.

By K. R. MATZ
National Carbon Company

5

Roll Them Out Like New

Cleaning Electric Machinery

The relative values of bucket and brush, spray cleaning and vapor degreasing. The subject of cleaning will be concluded in the next issue.

Valuable Lessons

OF ALL THE VARIETY of cleaning equipment, what could be simpler than a bucket and brush? Yet this pair shows up many of the basic problems which the more complex equipments attempt to solve. Here we can learn valuable lessons that will help us judge the effectiveness of other cleaning apparatus.

Although they are simple, the bucket and brush are often misused—with harmful results. As with most simple tools, good results depend upon understanding and skill. Properly used, this pair is a remarkably effective cleaning tool. The main point is to keep the dirt from getting into the clean solvent in the bucket. One way to do this is to brush on the clean solvent from the bucket, and let the dirty solvent drain off into another bucket or wipe it up. Remember, dirty solvent can carry dirt into otherwise clean places and

when it dries it leaves the dirt behind. This can be destructive, especially if the dirty solvent soaks into insulation surfaces, such as porous putty, string bands, insulation fabric, or the cracks in insulating varnish. Dirt in these places is the "stepping stone" path that allows electricity to leak across the insulation, and you've already found out what that means.

The danger from the use of dirty solvent is very real. There are cases on record of equipment that operated without failure up to the time of mileage overhaul in the shop. Shortly after the equipment was returned to service the armatures failed—each in the same way. Paths were burned across the insulation from the commutator to the steel band holding the winding in place. In some cases the steel wire of the band was burned through. This meant that, in addition to the rash of ground relay trips and flashovers, some armatures lost bands and windings. The trouble was a nightmare to the shop. No explanation was found until the cleaning solvent was examined. It was discovered to be loaded with conducting dirt, having been used over and over without filtering or distilling. A simple test showed what this meant. A paper towel was folded into a cone and filled with the solvent. After the liquid had drained through, a dirty deposit remained on the towel. Measurements showed that this deposit had a low resistance. When a pair of high-potential testing leads was touched to the surface

(continued on page 44)



Fig. 1—The simplest form of cleaning equipment.

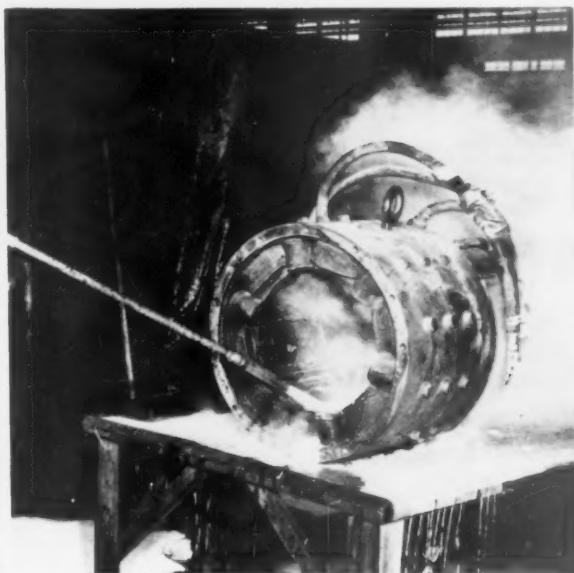
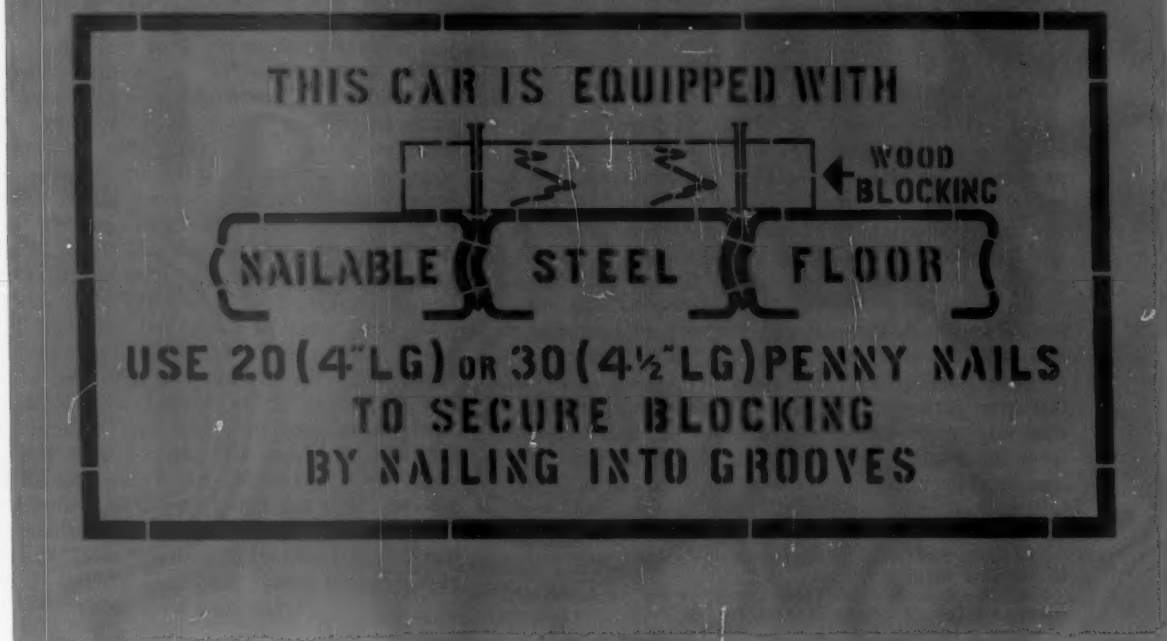
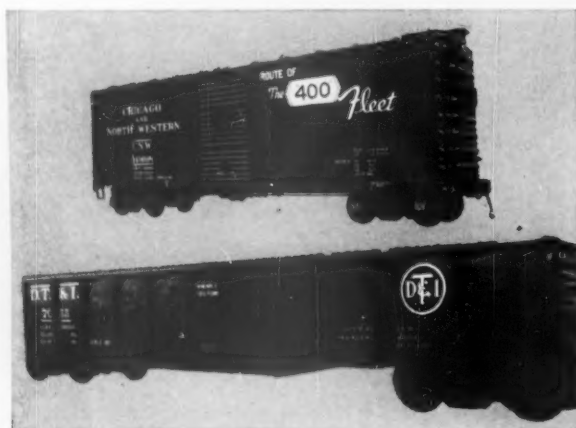


Fig. 3—Use of steam spray for cleaning parts.

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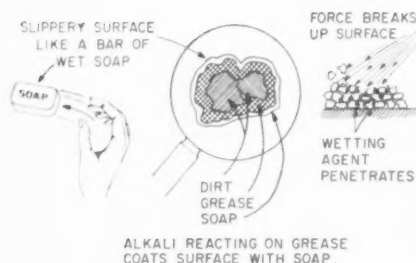


Fig. 2—How alkali cleaner removes dirt.

it broke down immediately, and the path between the points burst into flame.

Because it is so easy, there is a strong temptation to dunk the part being cleaned in the bucket or tank and let the dirt soak off. This may be fine at the beginning, but the reckoning comes at the end. Just when the solvent should be cleanest it is dirtiest. You can avoid this by changing from one bucket to another until the solvent drains off clean. But it takes a lot of solvent to keep the dirt concentration low enough. This points up another principle in cleaning: find a way to remove the dirt and use the same solvent over and over. Some methods use this basic principle.

The brush can speed up cleaning by supplying mechanical force to help the soaking off process. It pushes and scrubs through dirt layers so the solvent can penetrate. Here is another important factor to look for in other cleaning equipment and methods.

While the bucket and brush method is simple and effective, it has limitations. The process is painstaking, messy and slow. The workmen are in close contact with the solvent. There is the hazard of fumes that may be explosive or poisonous. Some safety and insurance codes prescribe the kind of bucket that must be used. This may be a metal container with a close-fitting hinged lid, Fig. 1. The opening is covered with a depressible screen which must be pushed down to reach the solvent.

Spray Cleaning

One widely used method of cleaning insulation is to spray with solvents. The solvent is combined with compressed air through an aspirator and blown against the part to be cleaned. Remember the bucket and brush lesson, and watch out for good drainage of the dirty solvent away from the parts being cleaned. Be especially careful to provide good ventilation. This is important when the work is done in a confined space.

Where climate and conditions permit, spray cleaning may be done outdoors. Even here, however, suitable precautions should be taken to protect the operator. Plastic helmets, like those used by divers, are available. These are fitted with a hose supplying air for breathing. The air should be pumped from a source far enough away from the operation to insure that it is free from fumes. The same clean air can be used for operating the spray gun. The arms and hands should be protected, and suitable clothing worn to keep the solvent from getting into the skin.

It is the presence of grease or oil that usually causes

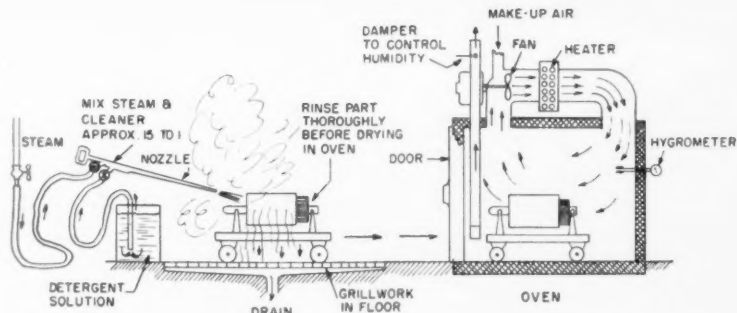


Fig. 4—Typical set-up for cleaning electrical machinery by washing and drying.

dirt to cling to insulation or metal parts. In general, the petroleum and chlorinated types of solvents dissolve the grease and oil, and the dirt floats off with it. When dirt is mechanically bonded to or imbedded in the surface, the solvent can do very little to move it. The blast of air and force of the liquid may, however, help move some of the looser dirt particles.

Washing

Scrubbing with plenty of soap and hot water is a time-honored method of cleaning locomotives as well as small boys. It obtained widespread popularity in the days of steam engines and is still favored in many railroad shops. It can handle a much larger volume of work than the little bucket and brush. Its effectiveness depends upon the heat and force of the water to soften the hardened grease and speed up the chemical activity of the cleaner. An alkali cleaning agent, such as the sodium phosphates, silicates or hydroxides is used. This reacts with the grease to form a layer of soap around the particles and gobs of dirt. This makes the particles of dirt just about as slippery as a wet bar of soap, Fig. 2. They no longer stick to one another or to the surface, and are easily removed by the hot water.

Various wetting agents and emulsifiers are added to the cleaning agent to make it more effective. While the wetting agents used are usually trade secrets, they all serve to make the water penetrate. Sometimes water will just roll off a dusty surface, especially if it is at all greasy. The wetting agent makes the water stick and soak in. The purpose of the emulsifier is to break the grease into small particles so it can float off with the water.

This washing solution can be used in a number of ways. The simplest method is to have a large tank filled with hot water and cleaning solution. The parts to be cleaned can be dropped in and left to soak until the dirt and grease float off. This is likely to be pretty rough on insulation, and is not recommended for electrical parts. However, it is effective on steel parts and has the advantage of requiring little labor.

For cleaning insulation it is preferable to spray the water and alkaline cleaner, using steam or air. Steam under pressure is usually combined in a nozzle with a suitable cleaning solution and the spray directed against the part to be cleaned, Fig. 3. The steam, water and cleaning agent work together to loosen and remove the dirt. Solutions for this purpose are usually

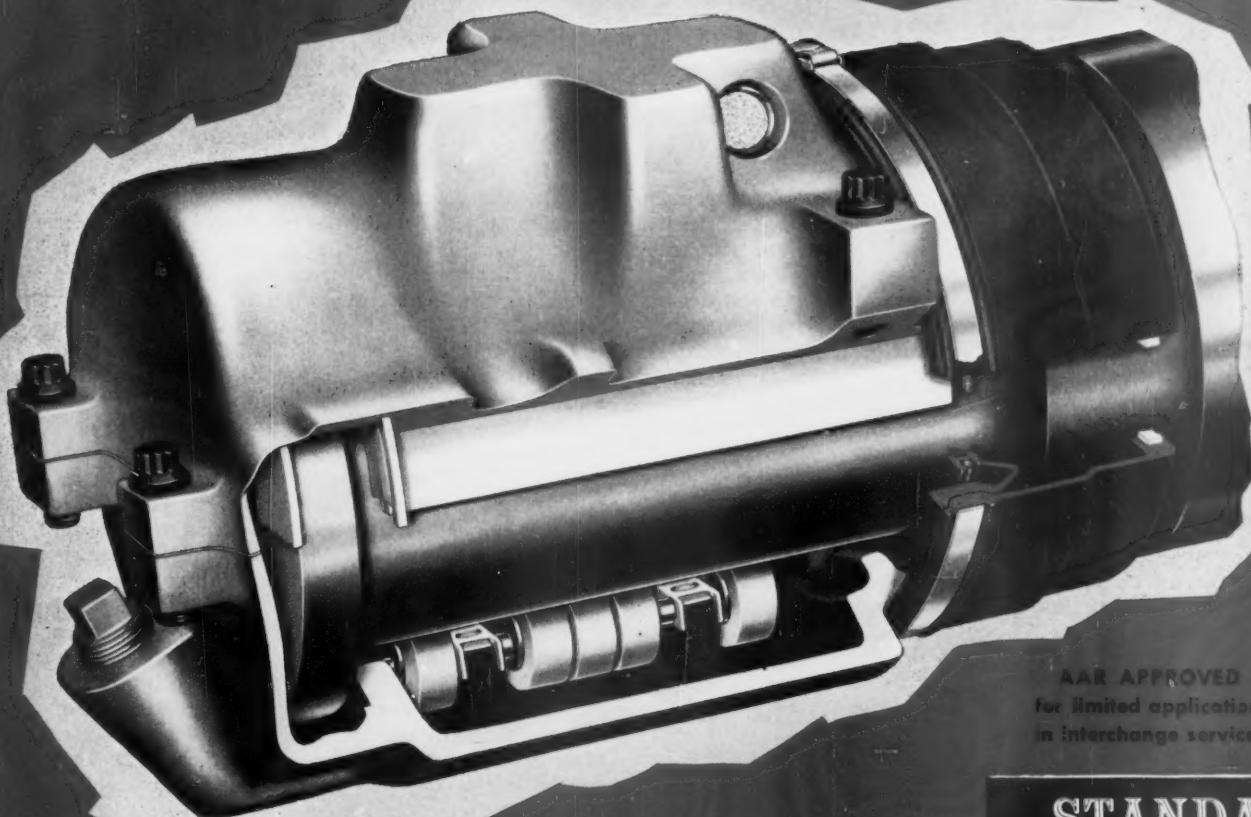
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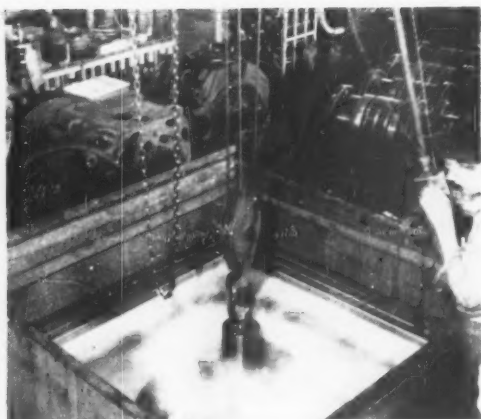


Fig. 5—Vapor Degreaser in use.

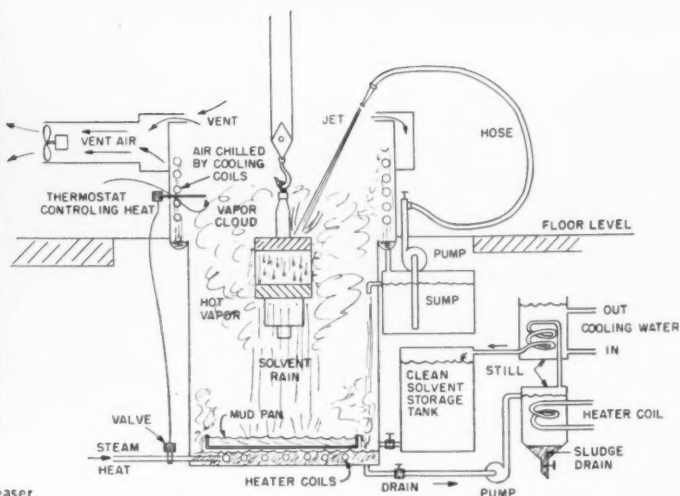


Fig. 6 (At right)—Schematic arrangement of a vapor degreaser.

made up in a barrel or vat, using selected detergents, alkalis or soaps. A hose connecting to the steam nozzle sucks the solution up and it is mixed with hot steam. After the cleaner has done its work the insulation should be sprayed with clear hot water and steam to completely rinse off the alkali. This is important because any of the cleaner left behind, even as a dry powder, will be a hazard. If this residue should later absorb moisture from the air or get wet it will become a good conductor of electricity and could cause electrical breakdown of the insulation.

Just as was the case with solvents, we are still looking for the perfect cleaner. The properties desired are ability to wet and penetrate, and ability to scrub and emulsify. Yet, at the same time, the cleaner should remain chemically and electrically neutral. Each cleaner has some of these properties, but no one cleaner has them all.

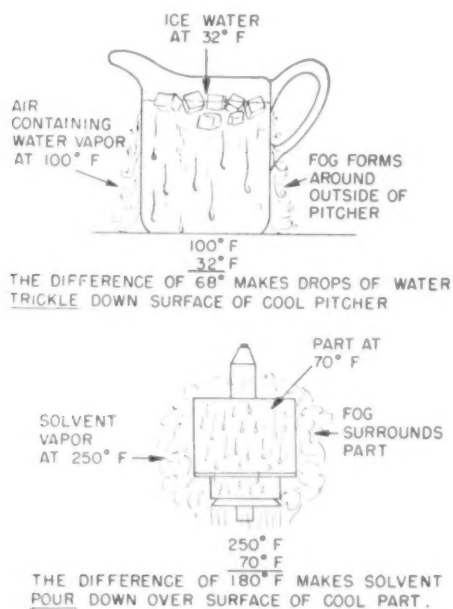


Fig. 7—How the condensation principle is used in a vapor degreaser.

Regardless of the cleaner used this method wets or soaks the insulation. The machine must therefore be thoroughly dried out after cleaning. This is usually done by heating it in an oven, Fig. 4. Such an oven should be ventilated to carry the moisture away. Otherwise the hot air will become saturated with water vapor and the part will not be dried out. Drying time depends upon the size of the machine, but usually takes several hours. Insulation resistance should be measured from time to time during drying, and the process continued until a constant reading is obtained. Don't be surprised to see the insulation resistance fall as the machine heats up in the oven. It will start to rise when the moisture begins to be driven off. This rise should continue until the machine is dry. Then the insulation resistance will become steady. Even this value may not be as high as you would expect because ordinarily a hot machine has lower insulation resistance. You may expect a big improvement in the reading after the machine cools off. If the value remains low after the machine has cooled, it may be necessary to repeat the drying process. More likely, however, there is an electrical fault. This may be just a dirty spot that was missed in washing, or it may be something serious.

In addition to the oven, it is desirable to have a floor space made up of grillwork where the machine can be set for steam jet cleaning, Fig. 4. This allows the spent water and dirt to drain off so the operator does not have to stand knee-deep in hot water. As an additional convenience, the work may be placed on a car running on a track. After cleaning and rinsing it can be easily pushed into the drying oven. Where shop steam is not generally available a small, portable flash boiler can be used. In some cases local ordinances or state laws may require that the drainage be treated to meet water pollution requirements.

While steam jet cleaning is old it is still very popular with many shops and maintenance men. The force of the steam is good for moving large accumulations of dirt, and for reaching into pockets and cleaning them out. Its chief drawback is that the insulation is soaked and time is consumed drying it out. This is

(continued on page 50)

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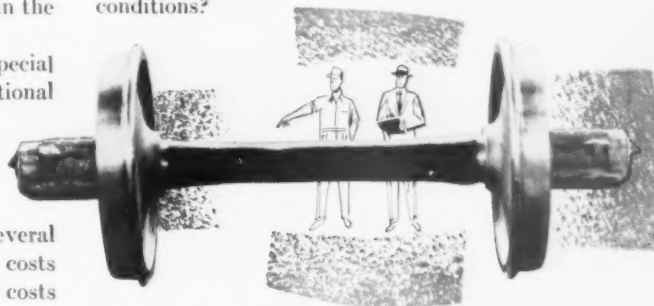
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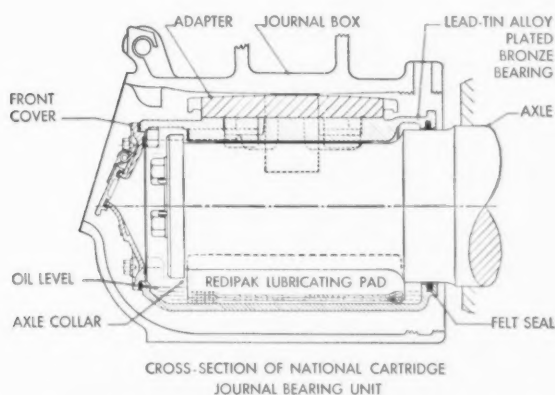
In addition, the National Cartridge Bearing offers several important savings over roller bearings: savings in first costs . . . savings in installation costs . . . savings in removal costs when a wheel change is needed.

If your road is not already testing this "journal bearing of

the future," why not see for yourself what this remarkable new cartridge bearing can do under your particular operating conditions?



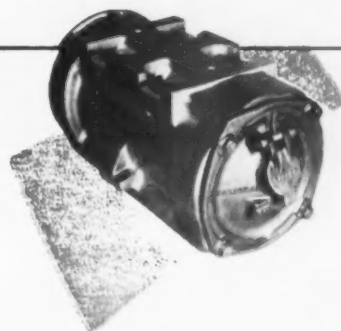
Wheel, axle and cartridge sets are made up in advance for assembly into trucks. No bearing work is done on the rip track.

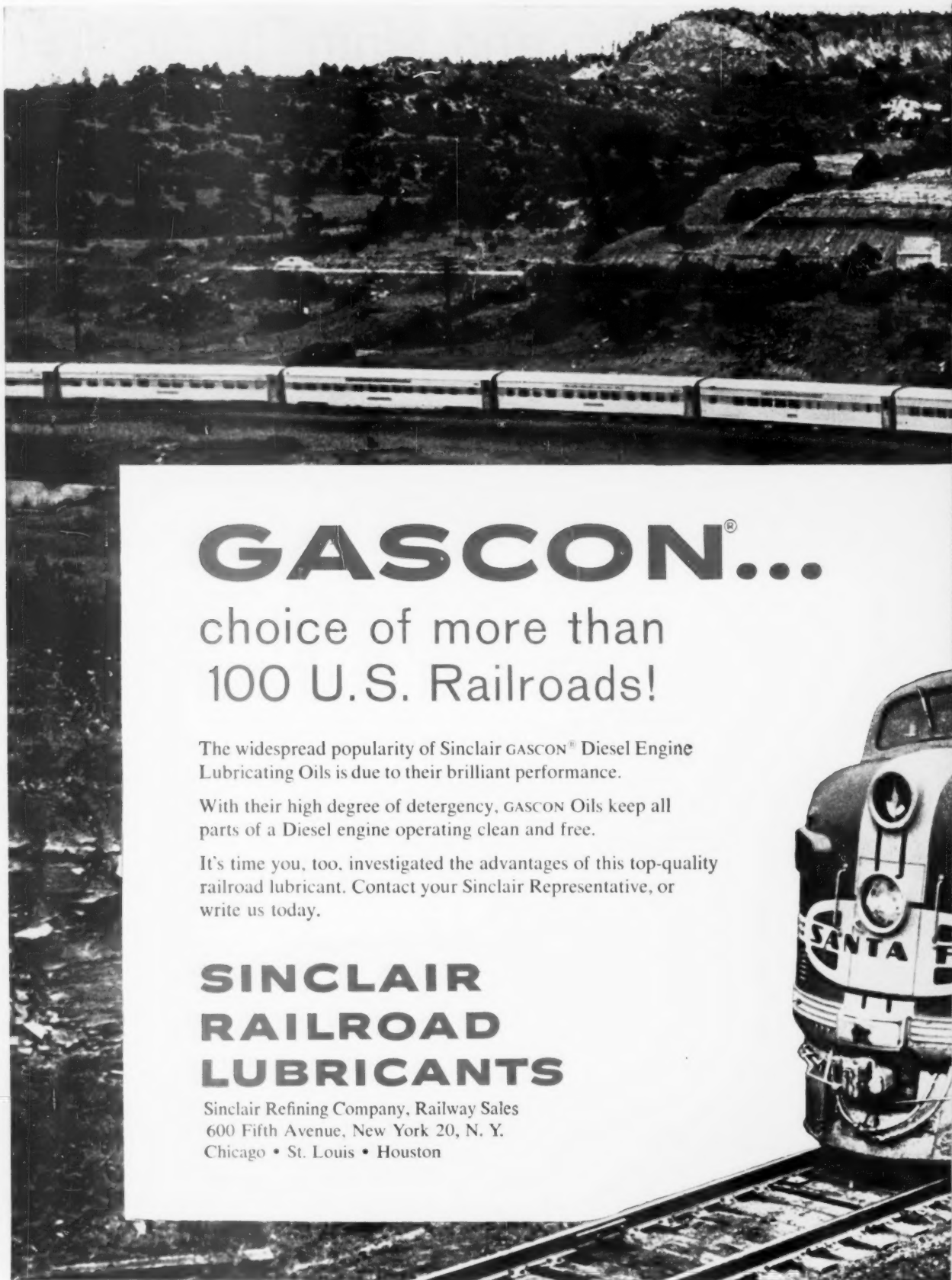


The cartridge bearing encircles the journal. The journal collar is machined off to permit assembly, and a separate collar is secured with cap screws. The cartridge unit, shown with an adapter, which can be used with an integral box or a pedestal side frame, is cast of high strength bronze and plated with a heavy-duty lead-tin alloy. It contains its own lubricating system and is effectively sealed by a lubricated felt ring riding on the conventional dust guard diameter. The lubricating pad is installed when the cartridge is applied to the axle. Oil is contained in the cartridge, not in the box. The usual journal box is not needed.

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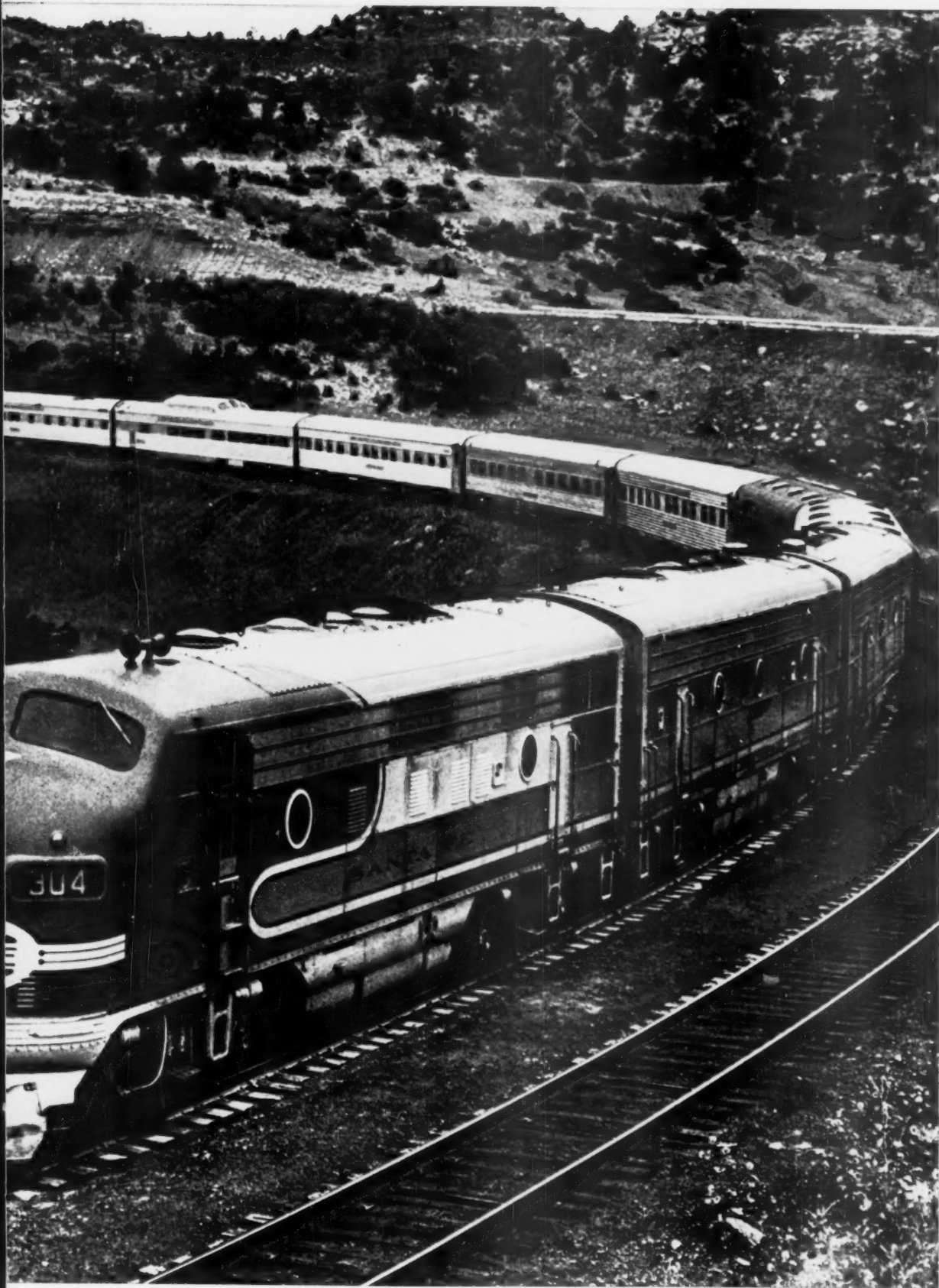
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one of the factors that has led to the increasing popularity of the vapor degreaser in recent years.

Vapor Degreaser

Competing with the time-honored steam jet method of cleaning we now have the vapor degreaser, Fig. 5. At present, preference is probably about equally divided between the two. In order to judge its merits, let's see how the vapor degreaser works, Fig. 6.

Chlorinated hydrocarbon solvents, trichlorethylene and perchlorethylene boil at approximately 180 and 250 deg F respectively. The latter, as you see, has a boiling point above that of water (212 deg F). The solvent is heated to the boiling point in a large, deep container open at the top. This is usually done with steam coils in the bottom of the tank. Other heating methods may be used, but care must be taken not to have too great a temperature difference. At higher temperatures the solvent may break down and form dangerous chemicals. The upper part of the container is kept chilled by water cooling pipes surrounding the open top. This keeps the hot vapors from escaping. As they reach this chilled area they condense and the liquid solvent falls back into the tank like rain.

When a part, such as an armature of field coil is to be cleaned, it is lowered into the hot vapor in the tank. At once the part becomes wet with solvent because it is colder than the hot vapor. You've seen the same thing happen with a pitcher of ice water on a hot, humid day, Fig. 7. The cold pitcher chills the air around it. This causes the water vapor to condense and wet the outside of the pitcher. In the same way the cold part chills the solvent vapor, and liquid solvent condenses on its surface. As long as the part remains cool enough, fresh, clean solvent continues to condense on its surface. As soon as the part heats up to the temperature of the vapor this action stops. While it goes on, however, the action is so intense that the part is cleaned in a few minutes.

In addition to the action of the vapor, a powerful jet of clean solvent can be squirted on the suspended part to dislodge large masses of dirt. Solvent for this purpose can be drawn from the gutters under the condensing coils near the top of the degreaser tank. From there it can be run into a separate tank and then

pumped through a hose and nozzle. The strong jet of liquid adds a scrubbing action to the cleaning process. An armored hose with a special plastic lining will give longer life in this service.

If a cleaner is used that has a higher boiling point than water, the part will become hot enough to drive off moisture. In this way cleaning and baking can be combined. Parts with pockets should be tilted or up-ended to spill out the solvent before leaving the tank.

After the cleaned part is removed from the vapor degreaser it is ready to be worked on as soon as it has cooled enough to handle. A dusty residue often remains after the solvent has evaporated. This can be blown off with an air hose. Be sure to do the job in front of a suitable exhaust hood so the dust will be carried away. As with other cleaning solutions, only the grease and oil are removed, and whatever dirt floats off with the liquids. The imbedded or mechanically adhering dirt will remain.

The vapor degreaser has the advantage of cleaning the part with a continuously distilled, clean solution. Also, no oven is required for drying after cleaning. On the other hand, the solvents used are very powerful and work fast. If proper precautions are not used and the part is left in the vapor too long, the insulating varnish, as well as the dirt, may be entirely removed. This is especially true of the various silicones when used on the surface where the vapor can get at them. While excellent for high temperature, the silicones need extra care in this cleaning process because they are so soluble. In any case, leave the part in the vapor only long enough to remove the soluble dirt. Experience and observation of the results will soon teach how long the various parts need for cleaning.

From another point of view, it's not a bad idea to remove a little of the outside skin of the insulating varnish. This is the part that may be cracked and have tiny dirt particles embedded in it. Also, removing some of the old skin makes room for a new layer of varnish without increasing the thickness of the entire coat. This helps keep the machine cool in service.

In short, the vapor degreaser is one way to handle a large volume of cleaning work in a minimum time. As a result this method has become firmly established on many properties.

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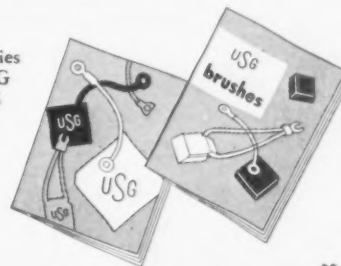
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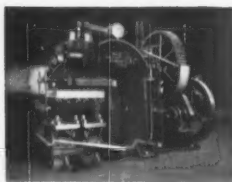
In recent years nearly every reputable brush manufacturer has improved the anchorage of the shunt connections: none, however, are quite as firm or quite as permanent as the method employed on USG Brushes, called STATITE[®]. The shunt can't be jerked out and, of course, it does not jar loose.

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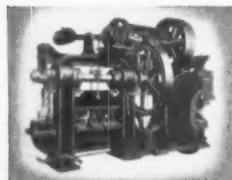


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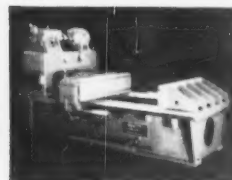
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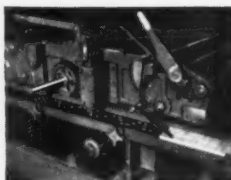
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Remember Number 5

(continued from page 39)

Probable Cause of the Trouble

For the operation of the speed control in any one EMD unit, the *ER* relay must be energized and closed. This relay has contacts which open when the relay is de-energized and these contacts interrupt the circuits supplying the *A*, *B*, and *C* solenoids of the governor speed control. The relay has no effect on the circuit to the *D* solenoid.

Thus, de-energizing the *ER* relay will cut out the *A*, *B*, and *C* solenoids, and bring the engine to idle speed if the throttle is in runs 2, 3, 4, 7 or 8.

Should the *ER* relay become de-energized when the throttle is in run 5 or run 6, the *D* solenoid will remain energized and cause the engine to stop.

The *ER* relays in the individual units are normally energized and closed by the current received from the *FP* wire which runs throughout the locomotive. This wire is energized through the *PC* switch (or relay) fuel pump switch or fuel pump fuse.

The *ER* relay in each unit will become de-energized from any of the following causes — note them carefully:

1. Isolation switch not fully in *run* position.
2. Failure of alternating current supply causing *No A-c Voltage* relay to open.
3. Ground protective relay tripped.

Those three items are the ones that most frequently cause an engine to die in the No. 5 throttle position.

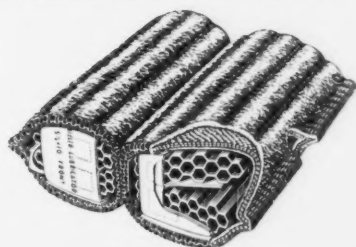
In the light of what happened in this case, it is believed that the *Isolation* switch was not fully in *Run* position, or that something caused it to lose full contact as it was starting out on its run.

When the fireman started operating the engine from the lay shaft, he no doubt reclosed the *Isolation* switch and got a good firm contact. When that happened, the *ER* relay became fully energized, which is the condition that must prevail to keep the engine responding to the throttle control.

In any case, no further trouble was experienced with the GP-7 unit after the fireman speeded up the engine from lay shaft control.

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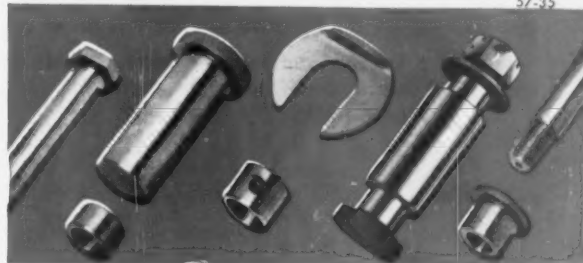
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Fumigation

(continued from page 33)

ing upon the fuel atomizes it.

- Carburetor adapted from a Briggs and Statton 2.5-hp engine. The carburetor was mounted in a by-pass of the primary air supply line. A constant percentage of the engine air requirement passed through the carburetor and atomized fuel, carried by this by-passed air, joined the primary air supply and was admitted to the engine.

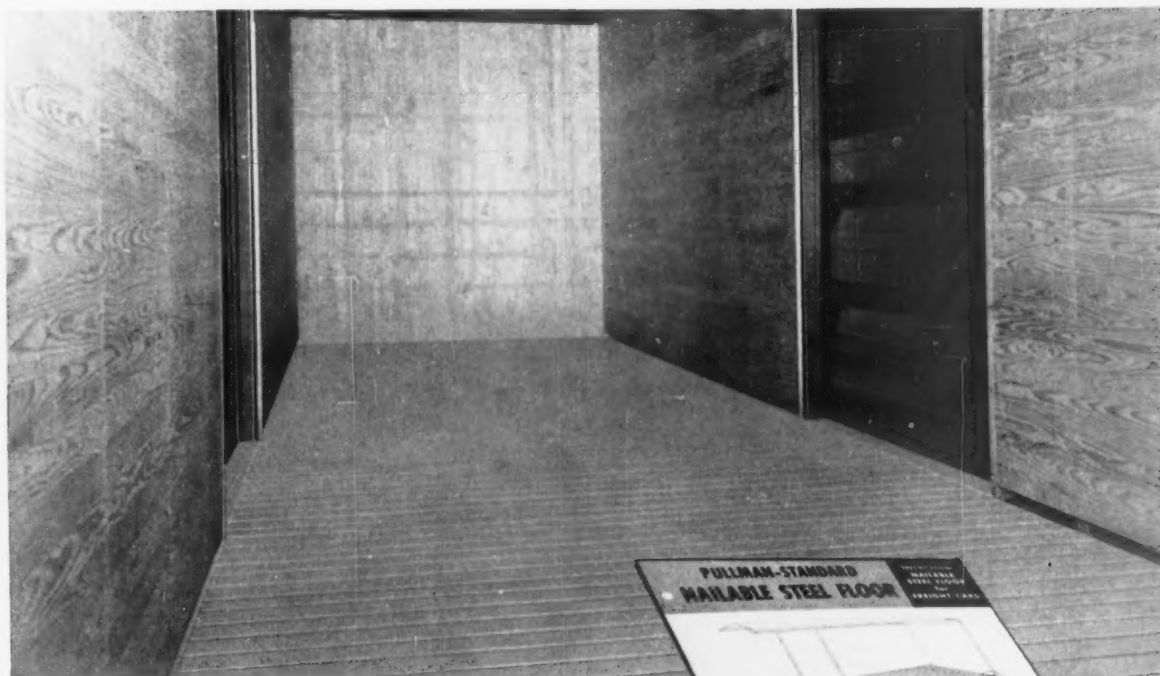
- Vaporizer—a metal container through which all the air to the engine was fed. The bottom of the container was electrically heated above the boiling point of the supplementary fuel so that the fuel would flash immediately into vapor upon hitting it. This resulted in high intake air temperatures.

The most obvious use of fumigation is for reduction of exhaust smoke or increase of smoke-limited power output. From the standpoints of convenience and effectiveness, normal diesel fuel—same as the primary fuel—is recommended for normal fumigation. The complication of the two-fuel system is thereby avoided. A low ignition quality fuel, such as gasoline, used in quantities of 30 to 40 per cent of the total fuel rate could bring higher power boosts, but intake pipe induction of diesel fuel in such quantities would cause preignition under certain operating conditions and control over the engine would be lost. When restricting the amount of supplementary fuel to 10-15 per cent of the total, regular diesel fuels are superior to gasoline if a fine spray is used in both cases.

Fuel Savings

Another promising use of fumigation is to reduce fuel consumption. Apparently all types of diesel engine could improve their fuel consumption by its judicious use. Regular diesel fuel—10 to 15 per cent of the main fuel—should serve as supplementary fuel, and fumigation should be cut out whenever the load drops below an established percentage (between 75 and 85 per cent) of full load. For best fuel economy, it is essential that a mist generator

(continued on page 58)



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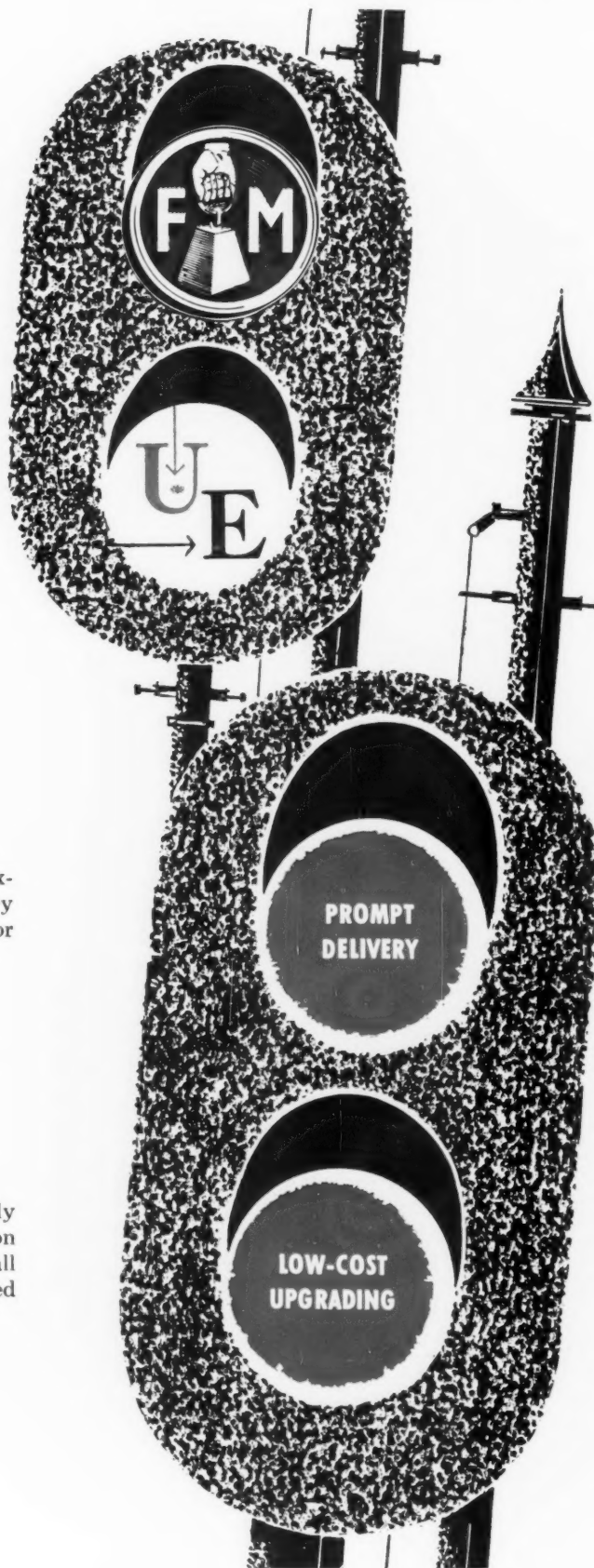
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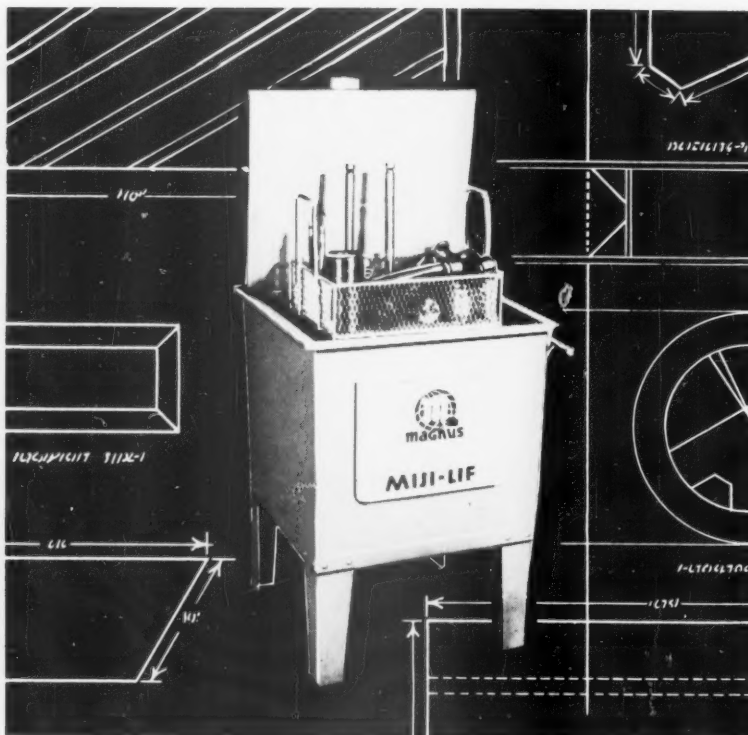
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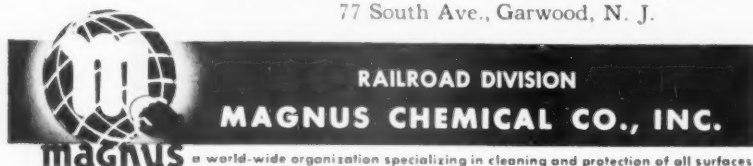
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77 South Ave., Garwood, N. J.



Fumigation

(Continued from page 54)

or equivalent be used. With Micro-Fog, full-load fuel economy could be improved by some 10 per cent, while with an ordinary pneumatic spray nozzle only about 5 per cent.

The saving in fuel consumption will be less in two-stroke cycle engines where much air is used for scavenging the cylinder. Assuming that the short-circuited air amounts to 25 per cent, which is a good average figure for diesel engines with unsymmetrical timing, one quarter of the fumigated fuel would pass unburned into the exhaust. In order to minimize it, a reduction of the short circuiting and a reduction of the fumigation rate seems desirable.

The same holds, but to a much lesser degree, for supercharged four-stroke cycle engines with considerable valve overlap. However, the valve overlap is never so large that it would materially affect the economy of fumigation.

At present three factors are in the way of using the Norgren Micro-Fog mist generator on commercial engines: cost, bulk, and air consumption. The reason the Micro-Fog is so large and eats up so much horsepower is that only about 2 per cent of the total amount of atomized liquid is discharged as a mist with drop sizes under four microns and the other 98 per cent with larger drop sizes is returned to the tank.

A less extravagant atomizer is an ordinary pneumatic spray nozzle which also operates with compressed air but uses only about two pounds of air per pound of liquid, roughly one fiftieth as much as the Micro-Fog.

Still another application of the fumigation technique is to be able to burn fuels of low ignition quality in compression-ignition engines. The use of such fuels may offer economic advantage due to the price differential, or may be forced upon us by the nonavailability of regular diesel fuels in an emergency.

High-speed diesel engines have difficulty in burning diesel fuels of about 35 cetane number at light load or idle, although operation may be satisfactory at heavier loads. In

(Continued on page 60)

HOW EFFICIENT IS THIS OPERATION? HOW GOOD IS THE FINISHED PRODUCT?

Whether you are concerned with manufacturing or with purchasing rolling stock, these are questions of vital concern to you—for ultimately they govern the durability and cost of the end product. Here is just one example how HELIARC welding is helping railroads gain new product quality at substantial savings . . . the unit being fabricated is a galvanized iron and mild steel refrigerator car.

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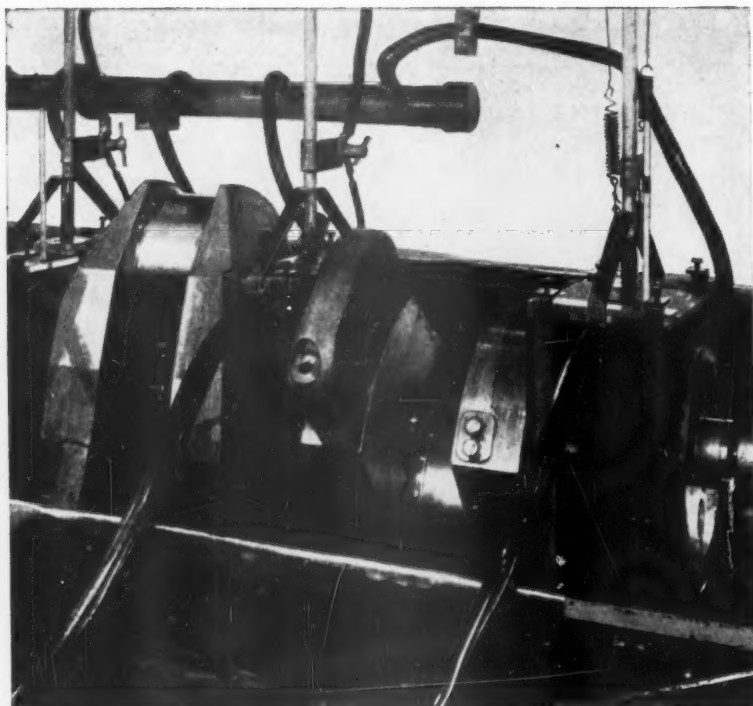
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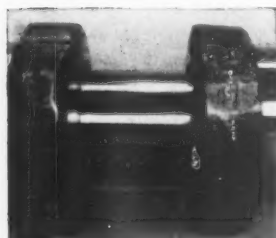


THIS REBUILT CRANKSHAFT IS CHROMIUM PLATED BY A SPECIAL NATIONAL FORGE PROCESS

When your crankshaft is reconditioned at National Forge, here's how it is chrome plated. Each bearing surface is individually boxed and plate thickness is built up only as required. Different thicknesses—over $\frac{1}{8}$ " if needed—can be added to different surfaces of the same crank. Because only the boxed surfaces are exposed to plating action the fillet areas retain their original strength.

When applied by National Forge specialists, chrome plating is uniform and smooth. Regrinding is kept to a minimum and your reconditioned crankshafts are returned to you meeting the original shaft's specifications.

No other plating company has National Forge's experience in handling both new and rebuilt crankshafts. So why not try National Forge specialists on your crankshaft rebuilding jobs?



This is a finished, repaired crankshaft after processing by National Forge.

For more details on crankshaft repair, write for Bulletin RC-1.

NATIONAL FORGE
AND ORDNANCE COMPANY
IRVINE, WARREN COUNTY, PA.

Fumigation

(Continued from page 58)

such a case fumigation of part of the main fuel at light loads will allow satisfactory operation at all loads.

If the main fuel has still lower ignition quality, as motor gasoline (approximately 20 cetane), the fumigation of the main fuel helps some, but better results are obtained by the fumigation of a higher cetane fuel doped with a cetane-improving additive. The ignition quality of the injected fuel ceases to limit its use in a diesel engine if the fumigation fuel is properly selected. Diesel fuel with a cetane of 29 could be satisfactorily used in a small, high-speed, open-chamber engine with a supplementary fuel of 44 cetane doped with $2\frac{1}{2}$ per cent amyl nitrate.

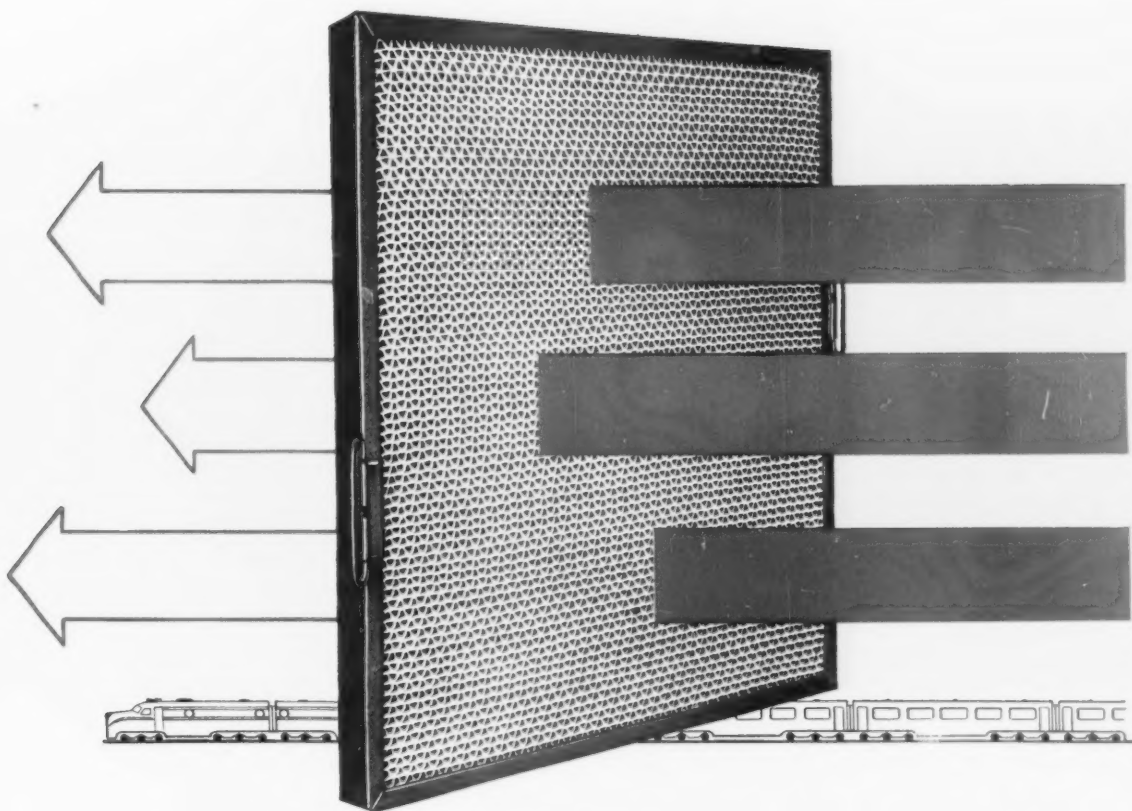
The fuel consumption at light load is always poor with fumigation; therefore, it should be used only when necessary and at the lowest possible rate that will insure steady running. Accessory benefits of fumigation are lower exhaust temperature, smoother combustion, reduced cylinder deposits, and probably reduced bearing wear. A good field for fumigation is in diesel driven trucks. It would enable diesel trucks to take grades without smoking. Neither the fuel bill nor the maintenance cost should be increased.

Locomotive Possibilities

An equally promising field for fumigation is railroad locomotives. Smoke reduction here may be secondary to the saving in fuel costs that can be achieved. The nature of locomotive operation is such that they run full load or at idle most of the time. This is favorable to fumigation. All locomotives are equipped with good size air compressors which can furnish all the air needed. Fumigation should permit the use of an economy fuel—a residual distillate blend with a cetane number of 25 to 35—which now costs at least $\frac{3}{4}$ cent less than standard No. 2 diesel fuel ordinarily used.

If such a low cetane fuel is used for main fuel, it is advantageous to

(Continued on page 62)



Cut maintenance, increase engine life with Esso AIRFIL® Coating Oil

Esso's new AIRFIL Coating Oil for diesel engine air filters has such great dirt pick-up qualities that it can substantially cut maintenance costs and increase engine life. This is possible because of the reduction in abrasive

wear, lessening the need for replacements of engine parts. You, too, can profit from these benefits by using Esso AIRFIL Coating Oil in diesel air intake filters, and in air-conditioning filters.

Esso AIRFIL COATING OIL offers three important advantages:

- 1. Easy to apply...won't drip off.** In liquid form when hot, it may be applied quickly in the desired quantity, while at normal temperatures, it is a gel-like solid that won't run off.
- 2. Superior wicking qualities** mean a continually fresh surface is presented to the air. Successive layers of dust are rapidly wetted, keeping dirt-retaining efficiency at a maximum.
- 3. Insoluble in water**... won't emulsify, and so resists removal by rain or snow, yet it can be removed quickly by hot detergent wash or steam blast.

Esso offers a complete line of dependable railroad products. Valuable years of experience in research and development, combined with continual testing on the road and in the lab, stand back of the outstanding performance of Esso Railroad products.



RAILROAD PRODUCTS

For data sheet regarding specifications of AIRFIL Coating Oil, write to Esso Standard Oil Company, Railroad Sales Division, 15 West 51st Street, New York 19, N. Y.



NEW! A 35 Ton Hydraulic Journal Jack

First in the Industry!

You asked for it and here it is—a brand new jack designed and built especially for servicing heavier freight cars. It can raise 35 tons 6 inches—is only 9.7 high—weighs but 55 pounds. With the 35H9.7, the job of inspecting and renewing journal brasses can now be done without the danger of overloading a lower capacity hydraulic journal jack—and the work can be done faster with less effort! If you have the problem of lifting heavy cars, we suggest you get complete details on this new 35 ton hydraulic journal jack immediately. Write the world's oldest and largest manufacturer of lifting jacks for bulletin AD29-G.



Duff-Norton Jacks

DUFF-NORTON COMPANY

P. O. Box 1889 • Pittsburgh 30, Pennsylvania

COFFING HOIST DIVISION: Danville, Illinois

Ratchet Jacks, Screw Jacks, Hydraulic Jacks, Special Worm Gear Jacks,
Ratchet Hoists, Electric Hoists, Load Binders, Spur Gear Hoists

Fumigation

(Continued from page 60)

fumigate a higher cetane fuel (doped or undoped) when the engine idles, and then inject and burn only the main fuel when the engine runs at high load. Because fuel consumption is low at idle and fumigation constitutes a small portion of this, a relatively small additive fuel tank—not more than 40 gal—is adequate to feed the additive spray nozzle for the longest runs. The full load fumigation is effected by a second spray nozzle which is supplied with fuel from the main tank.

At Idle, 1 and 2 throttle positions additive fuel is fumigated through the additive spray nozzle. At 7 and 8 notches main fuel is fumigated through the main spray nozzle. At 3, 4, 5 and 6 notches, no fuel is introduced through the air intake.

The operation is completely automatic. A railroad can have the benefit of two-fuel operation without having a two-fuel system with two large tanks or mixers. In addition, it lowers fuel consumption. The two savings should add up to 5 to 10 per cent total saving in fuel costs. The savings will be higher when an economical mist generator becomes commercially available.

Based on this work, the Pennsy already is testing equipment for application to its locomotive fleet.

All-Welded Aluminum Doors

(Continued from page 32)

will be supplemented by accelerated service tests of several doors in a commercial laboratory. One test will subject the door to 48,000 complete opening-and-closing cycles, simulating about 30 years of actual service, based on eight openings in each of 200 annual working days. In a second test, the doors will be placed horizontally, supported by only the edge members, and subjected to uniform loads up to 200 lb per sq ft to simulate maximum bulk car loading with doors in closed position. An ASTM corrosion test will be made, with doors exposed to salt spray atmosphere continuously for 240 hr.

On these diesel-electric locomotives...

**Intake air is thoroughly cleaned
with AIR-MAZE oil bath filters**



For over four years, General Electric locomotives for export service have relied on Air-Maze oil bath filters for cleaning the intake air to their efficient Cooper-Bessemer diesels. And for good reason:

Air-Maze oil bath filters maintain at least 92% efficiency* . . . even at lowest locomotive speeds. That's because their inherently high efficiency does not depend on high air velocity as do other filtering devices.

For most locomotive service requirements, maintenance is confined to simply checking oil level every month, filter oil changes at three month intervals, and cleaning a bowl once a year.

Reports from leading railroads in this country show that Air-Maze oil bath filters double . . . often triple . . . power assembly life. Savings in engine and filter maintenance often pay for the cost of the filter in less than a year.

These important advantages can be applied to all locomotive diesels today. For complete data, call us or contact your locomotive builder. The Air-Maze Corporation, Cleveland 28, Ohio. Dept. RL-12

*With Standard Air Cleaner. Fine test dust, 39% of which is less than 5 microns.

The biggest names in diesels are protected by Air-Maze filters.

AIR-MAZE

The Filter Engineers

ENGINE AIR FILTERS • CAR BODY FILTERS • LUBE OIL FILTERS • PASSENGER CAR FILTERS



How Oakite Steam Gun Cleaning delivers low-cost end results

Better *results* almost always mean bigger *savings* in cleaning. So use the best in methods as well as materials—it's least expensive in the end.

Cleaning with this Oakite Steam-Detergent Gun, for example, amplifies the penetrating, soil-loosening action of cleaning compound by means of steam heat and jet force.

It blasts out even heaviest, most stubborn soils from hard-to-reach places. It cuts clean-up and rinsing time as much as half. That's a *big* contribution to real economy.

This money-saving equipment has no end of uses. Connected to your steam supply, the gun can clean traction motors, truck, locomotive frames—even strip paint. Want it demonstrated in your shop to your men? Just write OAKITE PRODUCTS, INC., 46 Rector Street, New York 6, N. Y.



... gives you the important advantage
LOW-COST END RESULTS

Export Division Cable Address: Oakite

RAILROAD DIVISION

What's New

(Continued from page 24)

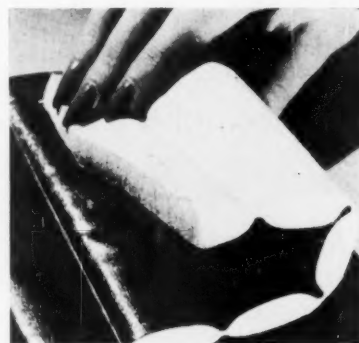


close air seal. Substantial ball bearings contribute to long, smooth running, and there are fewer moving parts.

A power regulator permits running a series of nuts down to the same degree of tightness. Power regulator setting No. 5 gives full power to blast loose tight, rusted, and frozen nuts. Only a 180-deg turn is needed to vary power from setting No. 5 to setting No. 1.

An angle attachment is available for reaching ratchet wrench spots. A molded rubber ring protects the nose of the wrench, and a wire hanger permits hanging when not in use, or use in a suspended position.

Both models weigh 5½ lb. Model 315 with a ½-in. drive has a ⅝-in. bolt size capacity. Model 317 drives with a ⅝-in. square and has an 1¼-in. bolt size capacity. A metal carrying case is available for wrench and sockets. *Albertson & Co., Dept. RLC, Sioux City, Iowa.*



Upholstery Material

Naugafoam is a permanently combined latex foam rubber and vinyl upholstery for upholstering backs, seats, front trim and arms of chairs, and for covering ottomans and cushions.

It is formed into a heat sealed sand-
(Continued on page 66)

NEW...

BROWNHOIST 150 TON DIESEL WRECKING CRANE

Designed specifically to meet rail, bridge and trestle load restrictions, the new Brownhoist 150 ton Diesel Wrecking Crane embodies the rugged construction, greater efficiency and low maintenance features found on the famous Brownhoist 250 Ton Diesel Wrecking Crane. Diesel engine is equipped with a torque convertor, and the crane travels on 2, six-wheel equalized steel side frame trucks. Operating cab is in right front corner with controls arranged for convenience and efficiency. All clutches are air operated. Write for complete information.



204

BROWNHOIST



CLAMSHELL BUCKET 250 TON WRECKING CRANE



COAL-ORE BRIDGE



CAR DUMPER

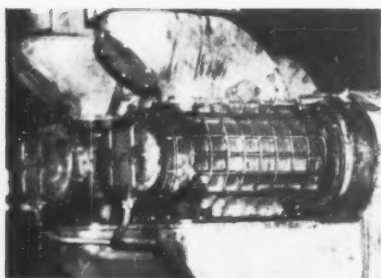


LOCOMOTIVE CRANE

INDUSTRIAL BROWNHOIST CORPORATION, BAY CITY, MICHIGAN • DISTRICT OFFICES: New York, Philadelphia, Cleveland, Chicago, San Francisco, Montreal, Canada • AGENCIES: Detroit, Birmingham, Houston

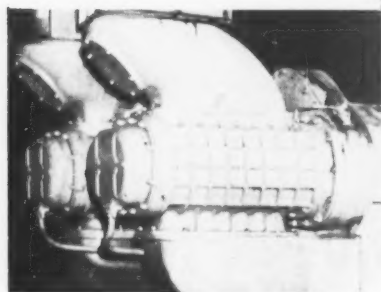
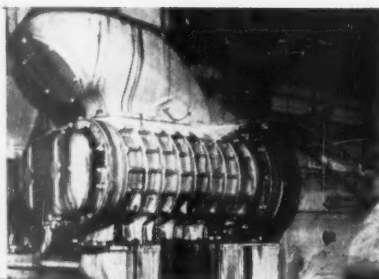
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**COME CLEAN
QUICKLY**



WITH

LIX

DIESEL KLEAN HEAVY!

More and more railroads are relying on LIX Diesel Klean Heavy—for periodic surface cleaning that keeps diesel engines shining bright, and for overhaul cleaning of all parts such as pistons, bearings, liners, filters, lube oil coolers, injection nozzles, brush holders, airbrake assemblies, etc. Lix cleans **FASTER** and **BETTER**—at **LOWER COST** per job. It **SOAKS** away caked carbon, grit, grease and grime . . . **NO BRUSHING OR SCRAPING** necessary. It leaves no granular deposits . . . reduces after-rusting . . . is harmless to all metals during cleaning cycle . . . and all metals can be cleaned in same tank. Lix is **SAFER**, too—is of low toxicity and, because of its high flash point, is not a fire hazard.

Because of its long life without frequent charges, Lix Diesel Klean Heavy is far more **ECONOMICAL** in the long run than "less expensive" cleaners!

WRITE, WIRE or PHONE for a no-cost, no-obligation DEMONSTRATION in your shop . . . see how you can cut cleaning time and reduce diesel maintenance costs!



Manufacturers of Lix Diesel Klean Heavy
and Lix Electric Equipment Cleaner

THE LIX CORPORATION
(OF MISSOURI)

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KANSAS CITY, MISSOURI

"Leadership in Industrial Cleaning"

wich, according to the manufacturer, with foam rubber $\frac{3}{8}$ in. thick in the middle, 25 ounce vinyl upholstery on top, and cotton sheathing on the bottom. The upholstery is shaped into $1\frac{1}{4}$ in. quilted channels.

As an upholstery material it is said to combine the resiliency of foam rubber with the color, durability and easy-to-clean features of vinyl.

Naugafoam comes in 15-yd rolls, 54 in. wide. Colors are crimson, yew, green, ginger brown, black and parchment. *United States Rubber Company, Dept. RLC, 1230 Avenue of the Americas, New York 20.*

HELPS FROM MANUFACTURERS

The following compilation of literature—including pamphlets and data sheets—is offered free to railroad men by manufacturers to the railroad industry. To receive the desired information write direct to the manufacturer.

P-S FREIGHT CARS AND PARTS.—24-page catalog, in color, contains descriptions and specifications of the PS-1 box car, the PS-2 covered hopper car, the PS-3 hopper car, the PS-4 flat car, and the PS-5 gondola, with similar data also on P-S freight-car parts—sides, ends, roofs, floors, underframes, doors, side bearings, floor clips, etc. (Write: *Pullman-Standard Car Manufacturing Company, Dept. RLC, 321 North La Salle st., Chicago 1.*)

SLING CHAINS.—4-page bulletin DH-101 discusses properties and capabilities of ACCO Registered sling chains. Lists seven main points to consider when ordering sling chains. Chart gives working load limits of two-leg chains of X-weld 125 or Endweldur 125 chain, based on 50 per cent proof tests. (Write: *American Chain & Cable Co., Dept. RLC, 929 Connecticut ave., Bridgeport 2, Conn.*)
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DIESEL ENGINE SPARE PARTS

NEW-UNUSED — BIG SAVINGS

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DURING RECENT ROAD TESTS, G-E motor support bearings were purposely bored out to simulate half-worn condition. Results from tests showed that even after wear, G-E bearings continue to save oil by returning excess oil to the axle cap.

General Electric motor support bearings have oil-return grooves. When you use these bearings on your locomotives in normal road and switching service, you'll find that up to 90 percent of the units can operate from monthly inspection to monthly inspection without the addition of oil to the axle caps.

DEVELOPED FOR GENERAL ELECTRIC'S GE-752 TRACTION MOTOR, these oil-return bearings have undergone extensive factory and field tests. These tests show that a locomotive in practically any type of service can get up to three times the mileage between oilings than would be possible with older style bearings. Besides giving you more miles between oilings, G-E support bearings give you

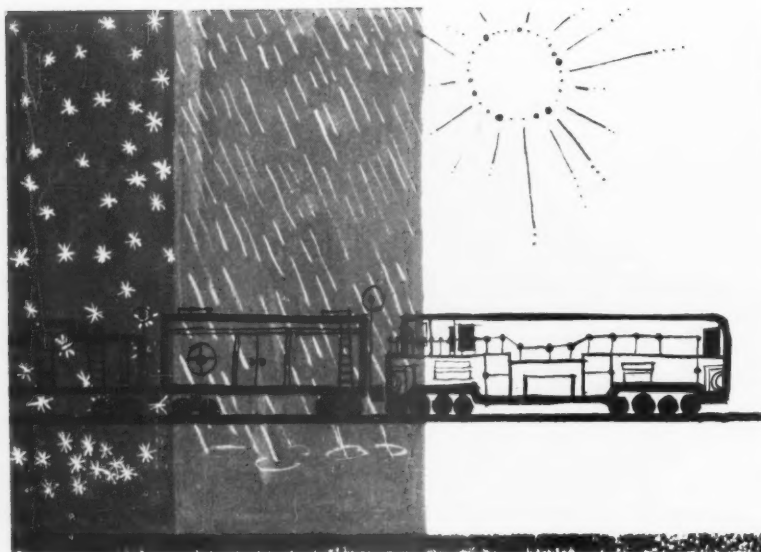
long life and save maintenance dollars through reduced oil consumption and more economical oiling schedules.

The wearing surface of all G-E lined motor support bearings is made of *tin base babbitt* for better bonding and resistance to breakage and wear under today's tough operating conditions. Precision boring and rigid construction means still less wear on bearings and traction motor gear.

YOUR NEAREST G-E RAILROAD REGIONAL PARTS CENTER or your locomotive builder will be glad to tell you about all of the features which make G-E motor support bearings your best buy. Always specify G-E traction motor support bearings . . . the bearings that are designed as an integral part of your G-E traction system. General Electric Company, Locomotive and Car Equipment Dept., Erie, Pa. 128-41

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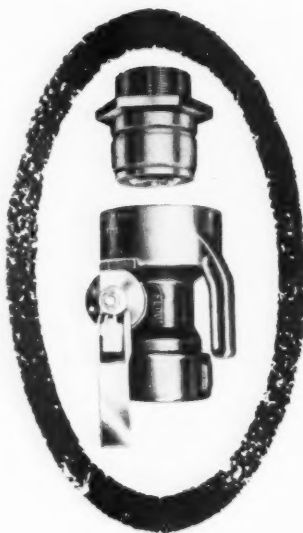


in all kinds of weather ... rain, sleet, snow, ice, sandstorms or desert heat ... the new Roylyn "Non-Spill" Fueling Valve operates BEST by TEST!

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Helps From Manufacturers

(Continued from page 66)

FREE-PISTON-ENGINE RESEARCH.

—36-page booklet traces development of new FP-165 turbocharged, free-piston engine. Presents diagrams, specifications and performance characteristics on each of five prototype models, and specifications and estimated performance characteristics on variations of FP-165 gasifier-turbine power plants. (Write: *Hamilton Division, Baldwin-Lima-Hamilton Corporation*, Dept. RLC, Hamilton, Ohio.)

RECONDITIONING CRANKSHAFTS.

—Eight-page booklet discusses the reconditioning of diesel crankshafts and illustrates operations involved. (Write: *National Forge & Ordnance Co.*, Dept. RLC, Irvine, Pa.)

AIR COMPRESSOR LUBRICANT.

—14-page illustrated booklet discusses Pydraul AC, a fire-resistant synthetic lubricant for air compressors. Contains data on air compressors for conversion from petroleum products to Pydraul AC. Includes typical properties. (Write: *Monsanto Chemical Company, Organic Chemicals Division*, Dept. RLC, St. Louis 24.)

SOLID AND OPEN STEEL FLOORING.

—8-page bulletin No. 50-9 describes five different types of steel for floors, stairs, steps, ramps, catwalks and platforms. Four-way raised-lug pattern solid steel safety plate, and nine different styles of open material illustrated. Plate and panel sizes, fastening methods, tables of safe loads and other engineering data included. (Write: *Joseph T. Ryerson & Son, Inc.*, Dept. RLC, Box 8000-A, Chicago 80.)

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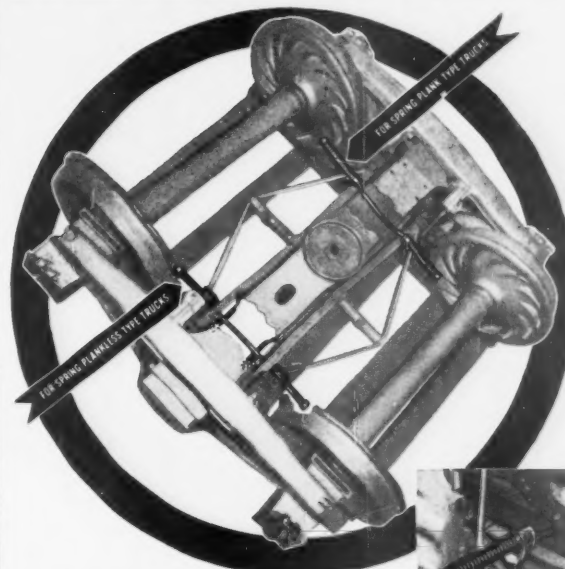
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1. One design fits both 5'-6" and 5'-8" wheel base trucks.
2. One rod length and one spring length. One interchangeable casting fits both spring plank and spring plankless trucks.
3. Ideal for interchange repairs. New design permits easy and fast applications under all conditions. Nuts need not be removed to apply or remove the support.

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lifts capacity
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8018

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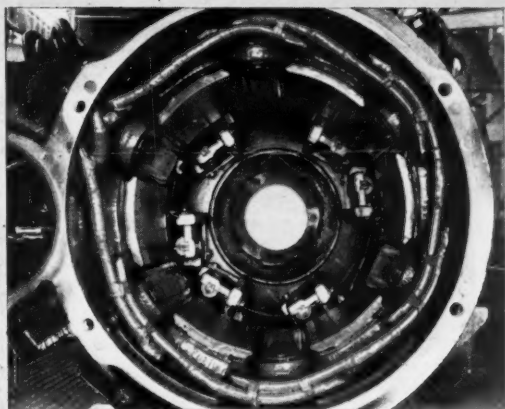
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Here's why
NATIONAL
 Plastic Molded
COPPER-CLAD
 Field Coils



*Insure Longer
 Service Life*



The main illustration shows a plastic molded, copper-clad interpole field coil for a railway traction motor. The small photo shows a set of such coils assembled with main field coils of the same construction in a traction motor frame. For details on how National plastic molded, copper-clad field coils can help reduce your motor maintenance problems, just drop us a line or call your nearby National field engineer.

- 1 Snug fit on pole piece eliminates coil movement and provides maximum heat transfer to the frame.
- 2 Monolithic construction resists damage from mechanical stresses and insures maximum heat dissipation.
- 3 Void-free insulation prevents penetration of oil, moisture and other deteriorating agents.
- 4 Proven heat-resistant impregnant imparts high temperature endurance.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.



ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
 REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

Over 1/2 of all "Roller Freight" cars now in interchange!

FORTY railroads and other car operators have put over 13,000 "Roller Freight" cars in interchange—letting other railroads share the benefits of their "Roller Freight" equipment.

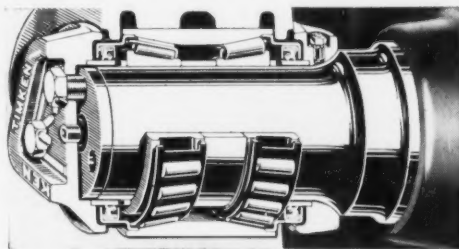
These forward-looking railroads have learned that "Roller Freight"—freight cars on Timken® tapered roller bearings—are the cure for the hot box problem. "Roller Freight" eliminates the cause of hot boxes—the friction bearing itself. "Roller Freight" in interchange makes for better railroading because the railroads can't be better than their interchange system. And by putting cars into interchange, railroads are speeding the day when all freight will be "Roller Freight".

Eliminating the hot box problem isn't the only way "Roller Freight" speeds service—cuts operating and maintenance costs for the

railroads. It cuts terminal bearing inspection time 90%, lubricant costs as much as 95%. Shipments move faster on the road *and* through terminals. It's helping the railroads give ever better freight service—helping them in the battle for business.

More and more railroads are making the switch to "Roller Freight". And they're putting important numbers of these cars in interchange service. When all freight is "Roller Freight" America's railroads will save an estimated \$224,000,000 in operating and maintenance costs, earn about 22% on their "Roller Freight" investment. To get the full story,

send for our free booklet, "How America's Railroads Can Save \$224,000,000 Annually." Write: The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



TIMKEN

TAPERED ROLLER BEARINGS ROLL THE LOAD